REVIEW DRAFT

WATER QUALITY RESTORATION PLAN
for
THE KLAMATH RIVER BASIN IN CALIFORNIA:
DRAFT SCOPING FOR TMDL IMPLEMENTATION

6.1 Introduction

The North Coast Regional Water Quality Control Board (Regional Water Board) staff are in the process of developing the implementation framework for the Klamath River Temperature, Dissolved Oxygen, Nutrients, and Organic Matter Total Maximum Daily Loads (TMDL). This Water Quality Restoration Plan for the Klamath River Basin in California: Draft Scoping for TMDL Implementation document (Water Quality Restoration Plan) is a preliminary and abbreviated discussion of the content that will be contained in the implementation chapter of the completed Klamath River TMDL Staff Report. This document provides:

1. an overview of the draft TMDL load allocations;
2. identification of potential responsible parties for the various pollutant sources; and
3. a presentation of potential permitting and other implementation mechanisms applicable to address each source input.

It also describes the Regional Water Board's current regulatory strategy for controlling source inputs, presents preliminary recommendations on improving existing regulatory controls, and discusses the implementation challenges of controlling sources where traditional implementation controls may not apply or where the Regional Water Board lacks implementing jurisdiction.

This Water Quality Restoration Plan is intended as a scoping device and invites input on the development of the Klamath implementation plan from all stakeholders, including government and tribal agencies, interested parties, and the public. Readers are encouraged to provide Regional Board staff with any relevant information on implementation, including, but not limited to:

- Pollutant source inputs not previously identified;
- Current efforts to address the TMDL pollutants and any documented success of such efforts;
- Other existing programs that could be incorporated into an implementation plan strategy;
- How to maximize the efficiency of implementation strategies for water quality improvement;
- Benefits and burdens of different implementation approaches;
- Compliance time schedules;
- Suggestions for tracking implementation and progress towards meeting water quality standards (i.e. compliance and trend monitoring); and

- Potential restoration ideas and other creative solutions for improving water quality in the Klamath Basin (e.g. pollutant trading, and centralized treatment of nutrients and organic matter).

6.1.1 Klamath TMDLs Administrative Process and Current Schedule

Regional Water Board staff have completed an administrative draft of the Klamath River TMDL Staff Report that addresses the water quality impairments to the Klamath River in California. The administrative draft includes the first chapters of the staff report: Chapter 1 - Introduction, Chapter 2 Problem Statement, Chapter 3 - Analytical Approach, Chapter 4 – Pollutant Source Analysis, and Chapter 5 – Klamath River TMDLs - Allocations and Numeric Targets. The administrative draft does not include the implementation plan chapter (Chapter 6), which is addressed in this Water Quality Restoration Plan. In July 2008, the administrative draft was submitted to the US EPA Regions 9 and 10, US Fish & Wildlife Service, National Marine Fisheries Service, US Bureau of Reclamation, State Water Resources Control Board staff, and the Hoopa Valley Tribe, Yurok Tribe, Karuk Tribe, Quartz Valley Rancheria, Resighini Rancheria, and the Klamath Tribe. In late July / early August, Regional Water Board staff met with these agencies, as well as with other parties who will be recipients of TMDL loading allocations, to present the draft allocations. The meetings included the US Forest Service, California Department of Fish and Game, Klamath Water Users Association, and PacifiCorp.

The Regional Water Board has since received comments on the administrative draft TMDL and staff have prepared a subsequent draft for peer review. The 30-day peer review period began February 2009. The responses to the peer review and initial public comment on Water Quality Restoration Plan will be incorporated into a public review draft that will also include the remaining chapters of the TMDL staff report and the Basin Plan regulatory language. The public review draft will be distributed for a 60-day public comment period in June 2009. Milestones for the adoption of the Klamath River TMDLs are presented in Table 6.1.

Table 6.1: Klamath River TMDL Development Schedule

Major Steps	**Month/Year**
Administrative Draft Review	July/Aug 2008
Peer Review (30-day)	February 2009
Implementation Plan Presentation to Regional Board	January 2009
Water Quality Restoration Plan Review (30-day)	February 2009
Implementation Plan Public Workshops	March 2009
Public Review (60-day)	June 2009
Regional Water Board Hearing	October 2009
State Board Hearing	June 2010
Office of Administrative Law Approval	September 2010
US EPA Approval	September 2010
EPA Establishes TMDLs if State TMDLs are disapproved or the State fails to act	December 2010

6.1.2 Regulatory Scope of Implementation

The State Water Board and the nine Regional Water Quality Control Boards have primary responsibility for the protection and enhancement of water quality in California. The Regional Water Boards adopt and implement water quality control plans (Basin Plans), which recognize the unique characteristics of each region with regard to natural water quality; past, present, and reasonably foreseeable beneficial uses; and water quality problems. The jurisdiction of the North Coast Regional Water Board encompasses all basins draining into the Pacific Ocean, including Lower Klamath Lake and Lost River basins, and extends from the California-Oregon state line southerly, to the southerly boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma counties. The North Coast Basin Plan is designed to preserve and enhance water quality and protect beneficial uses of all regional waters. Specifically, the Basin Plan (i) designates beneficial uses for surface and ground waters, (ii) sets narrative and numerical objectives that must be attained or maintained to protect beneficial uses, and (iii) defines implementation programs that include specific prohibitions, action plans, and policies to achieve the water quality objectives.

Reaches of the Klamath River in Oregon are on the Clean Water Act section 303(d) list for low dissolved oxygen, elevated temperature, chlorophyll-a, and pH. In California, the Klamath River is on the 303(d) list for organic enrichment / low dissolved oxygen (DO), nutrients, and elevated temperature. The DO listing only applies to the mainstem of the Klamath River, while the other listings apply to the entire Klamath River basin in California. In addition, the portion of the Klamath River watershed downstream of the Trinity River (i.e. the Klamath Glen Hydrologic Sub Area), partially within the Yurok Reservation, is listed for sedimentation/siltation impairment. In May 2008, the USEPA added the reach of the Klamath River that incorporates Copco 1 and 2 and Iron Gate Reservoirs to the 303(d) list for the blue-green algae toxin microcystin. In cooperation with Oregon Department of Environmental Quality and with support from US EPA Regions 9 and 10, Regional Water Board staff is in the process of developing TMDLs for these impairments, except for the sediment/siltation impairment. Before becoming final, the TMDLs must be approved by the Regional and State Water Boards and USEPA Region 9.

The TMDL Program is the primary program responsible for achieving clean water where traditional controls on point sources have proven inadequate to do so. The program thus is charged with creating plans that consider all sources and causes of impairment, and allocating responsibility for corrective measures, regardless of sources or cause, that will attain water quality standards. The TMDL establishes the allowable loadings or other quantifiable parameters for a waterbody that is the total permissible pollutant load that will achieve water quality standards. This “loading capacity” provides a reference for calculating the amount of pollutant reduction needed to bring a waterbody into compliance with water quality standards or designated uses. The TMDL identifies and assigns allocations to all sources of pollution, including waste load allocations (WLA) for point sources and load allocations (LA) to nonpoint sources (40 CFR § 130 .2(i)). A wasteload allocation (WLA) is defined as “[t]he portion of a receiving water’s loading capacity that is allocated to one of its existing or future point sources of pollution”. WLAs constitute a type of water quality-based effluent limitation (40 CFR § 130.2(h)).

A load allocation is defined as "[t]he portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources" (40 CFR § 130.2(g)). Wherever possible, natural and nonpoint source loads should be distinguished.

6.1.3 Components of TMDL Implementation Plan

The Klamath River TMDL must be accompanied by an implementation plan pursuant to Water Code section 13242. The implementation plan describes the nature of actions necessary to achieve water quality objectives, a time schedule for the actions to be taken, and monitoring to determine compliance with objectives. The implementation plan translates the information in the technical TMDL into discrete and identifiable actions that will bring the waterbody into compliance. It must redress all violations of water quality standards if possible and may use any combination of existing regulatory tools to do so. The program of implementation should take into account where the Regional Water Board may lack implementation authority.

6.1.3.1 Regulatory Tools

All point source discharges of pollutants to surface waters require a National Pollutant Discharge Elimination System (NPDES) permit under section 402 of the Clean Water Act. NPDES permits typically regulate the discharge of treated sewage, stormwater, and other pollutants discharged through a discrete conveyance such as a pipe, ditch or channel. An NPDES permit contains effluent limitations based on applicable technology and water quality standards. WLAs constitute a type of water quality-based effluent limitation (40 CFR § 130.2(h)), which triggers certain procedural and substantive legal requirements. For example, federal regulations require NPDES permits to be consistent with any WLAs in an EPA-approved TMDL (40 CFR §122.44(d)(1)(vii)(B); see also *Friends of Pinto Creek v. United States Environmental Protection Agency* (9th Cir. 2007) 504 F.3d 1007). Under Clean Water Act section 402(d), a downstream state has certain procedural remedies against an upstream source state's issuance of NPDES permits that may adversely impact that state's water quality standards. An NPDES permit shall not be issued "[w]hen the imposition of conditions cannot ensure compliance with the applicable water quality requirements of all affected States." (40 CFR § 122.4(d))

In California, discharges of waste that are not NPDES "discharges of pollutants" require the issuance of waste discharge requirements (WDRs) unless otherwise waived. Discharges of waste that are not subject to NPDES permits typically include runoff from nonpoint sources such as agricultural activities and waste discharges to land or to groundwater. For non-NPDES discharges, the Water Code generally does not dictate specific effluent limits. WDRs prescribe requirements, such as limitations on temperature, toxicity, or pollutant levels, as to the nature of any discharge (Wat. Code, § 13260, subd. (a)). WDRs may also specify conditions where no discharge will be permitted, (*Id.*, § 13241), and may also include monitoring and reporting requirements (See *id.* § 13267, Cal. Code Regs., tit. 23, § 2230). WDRs implement the Basin Plan, taking into consideration the beneficial uses to be protected, and water quality objectives reasonably required for that purpose, other waste discharges, and the need to prevent nuisance. (Wat. Code, § 13263, subd. (a).). The general regulatory scheme provides

flexibility to dischargers in choosing the methods they will implement to meet the requirements of the Porter-Cologne Act. (See, e.g , Wat. Code, § 13360 [preventing the water boards from specifying the manner of compliance].) If Best Management Practices (BMPs) or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations for NPDES dischargers can be made less stringent, or vice versa. Thus, the TMDL process provides for nonpoint and point source control tradeoffs (40 C FR § 130.2(i)).

Other existing regulatory tools include individual or general waivers of waste discharge requirements, basin plan prohibitions, and enforcement actions. Under Water Code section 13301, the Regional Water Board may issue a cease and desist order (CDO) if it finds a discharge or threatened discharge of waste in violation of waste discharge requirements or prohibitions. Under Water Code section 13304, the Regional Water Board may issue a clean up and abatement order (CAO) to any person who has discharged or discharges waste into waters of the state, or who has caused or permitted, or threatens to cause or permit waste to be discharged or deposited where it will be discharged, or threatens to create a condition of pollution or nuisance. Civil monetary remedies may be pursued for violations of WDRs, waivers, prohibitions, CDOs, CAOs, and other orders (See e.g. Wat. Code, §13350).

The Regional Boards can formally recognize regulatory or nonregulatory actions of other entities as appropriate implementation programs when the Regional Boards determine those actions will result in attainment of standards. For discharges of waste and other source inputs within Regional Water Board jurisdiction, this may be accomplished by a certification process that is accompanied by a waiver and includes a monitoring plan, conditions that require trackable progress, and a provision setting forth that certification and waiver must be revoked if the program is found to be not adequately implemented, not achieving its goals, or is no longer adequate to restore water quality.

6.1.3.2 State Nonpoint Source Policy

Implementation actions taken to achieve load allocations must be consistent with the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (State NPS Policy). This policy requires that "all current and proposed nonpoint source discharges must be regulated under waste discharge requirements (WDRs), waivers of WDRs, a basin plan prohibition, or some combination of these tools" (2007 Basin Plan, 4-33.00). For some pollutant sources, the method of compliance with this policy is already in place, and if it is determined to be sufficient, no further action by the Regional Water Board is necessary. However, if the source is currently unregulated, or the current permits, waivers and/or prohibitions are not sufficient to attain the TMDL, a means to comply with the NPS Policy must be proposed as part of the implementation plan.

Several factors are involved in the decision of which regulatory mechanism is appropriate to control a given source of pollution. For example, individual WDRs require the discharger to submit a formal report of waste discharge with a fee. General WDRs can be used to regulate large numbers of dischargers at once if the discharger falls within a

specific category. For example, the Regional Water Board utilizes general WDRs to control discharges from timber harvest activities on nonfederal lands. While general WDRs may not require a report of waste discharge, they always require a fee. Waivers of waste discharge requirements do not require a report of waste discharge, however the discharger may be required to submit a Notice of Intent to comply with the conditions of the waiver. The conditions included in the waivers are intended to control the allowable discharge so that it does not impact beneficial uses. Like general WDRs, waivers may apply to a category of discharges, but do not carry a mandatory fee. Waivers of waste discharge are currently being utilized by the Central Valley Regional Water Board to control discharges from irrigated lands. Prohibitions are typically used when the discharger category is not well defined and the overall threat to water quality is less severe. The Regional Water Board is not limited to choosing one means of regulation; a combination of regulatory mechanisms may be employed to control a certain category of discharges, as is currently being done, for example, to control sediment discharges from timber harvest activities in the North Coast Region.

The Klamath TMDL implementation plan will identify the parties responsible for controlling sources of pollution, describe their ongoing effort(s) to control impairments, and recommend additional implementation actions as necessary to comply with allocations. For the responsible parties, the implementation plan will describe the nature of the necessary actions to control pollutant sources to a level that meets the TMDL allocations. While the implementation plan may recommend specific actions to be taken by private or public dischargers, it is the responsibility of the discharger to ultimately meet the load allocation and comply with water quality standards. The implementation plan will also include Regional Board actions to effectively implement the TMDL and be consistent with the State NPS Policy. Finally, the implementation plan will include a time schedule and a monitoring plan to track responsible party compliance and trends towards compliance with instream water quality objectives and TMDL allocations.

Basin Plans are not limited to actions that the Regional Water Board can apply and enforce. As discussed in more detail in the Stateline allocation section, load allocations measured at the California/Oregon Border are assigned to sources within the State of Oregon, and will be allocated pursuant to the TMDLs being developed by the State of Oregon. Similarly, as discussed in more detail below, load allocations assigned to hydroelectric facilities regulated by the Federal Energy Regulatory Commission (FERC) are enforced by FERC and water quality certification from the State Water Board.

6.1.4 Basinwide Approach to Implementation

Achieving compliance with the Klamath River TMDLs will require a coordinated basinwide approach that involves state and federal agencies as well as responsible parties in California and Oregon. Coordinating implementation will focus restoration and regulatory programs on both short term and long term goals for the basin. Regional Water Board staff believe that short term measures are needed to immediately lessen the threat to the cold water fishery and tribal cultural beneficial uses, among others. The regulatory process will accommodate for short term measures working in concert with longer-term programs to achieve full compliance over a longer time frame. The two

water quality issues staff have identified as priorities for short term implementation are the reduction of nutrients and organic matter loading and the protection and restoration of thermal refugia in the mainstem and at the mouths of tributaries.

6.1.4.1 Nutrient Reduction

Nutrient loading is identified in the TMDL technical analysis as the source of myriad water quality problems including low dissolved oxygen concentrations, high swings in pH, and algal blooms that produce toxins harmful to humans, other mammals, and fish.

Recommended short term measures include:

- Wetlands restoration and wetlands treatment systems;
- Mitigation measures for ongoing nonpoint source discharges;
- Pollutant trading program; and
- Centralized treatment to reduce nutrients and organic matter

Reducing nutrient and organic matter loads in the Klamath River should target the largest sources of nutrient loads: the Upper Klamath Lake and Lost River basins. Nutrient and organic matter treatment systems work more efficiently when they are located closer to the source of pollution. In the Klamath basin, it makes sense for downstream dischargers to implement measures for pollution controls upstream to offset their contributions to water quality impairments. A pollutant trading program combined with centralized treatment of nutrients and organic matter would focus resources on improving water quality most efficiently. The Regional Board staff are considering the feasibility of several centralized treatment options, including treatment wetlands and mechanical removal of suspended algae, as well as looking at successful nutrient trading programs in other watersheds. Some of these options and programs are explained in more detail in section 6.7.

6.1.4.2 Protection and Restoration of Water Quality Refugia

Summer thermal refugia are areas of cool water created by inflowing tributaries, springs, seeps or groundwater in an otherwise warm stream channel. The technical TMDL found that properly functioning refugia are needed to meet temperature water quality standards because of the naturally elevated water temperatures in the Klamath River during the summer. Salmon species in the Klamath River rely on these refugia to escape stressful water quality conditions in the summertime.

Recommended short term measures include:

- Restoration and protection of thermal refugia; and
- Riparian restoration.

Decades of timber harvest and road construction in the Klamath River basin have degraded riparian conditions and increased sediment loads in many tributary watersheds; reducing the quantity and quality of thermal refugia. Addressing these impacts in the long term will require implementation of best management practices for ongoing land uses including road maintenance measures and decommissioning, where applicable.

However, more immediate measures are needed to restore thermal refugia and ensure their proper functioning in the short term while the long term measures are being implemented. Restoration of refugia involves two components; restoration of the structure of the refugia themselves through mechanical means, and uplands riparian restoration to reduce water temperatures in the tributary watersheds. Structural restoration is a short term measure that is needed to provide immediate access to refugia from the mainstem Klamath River and to preserve the spatial extent of cold water plumes in the mainstem. Riparian restoration is a longer term measure needed to ensure tributaries maintain and improve their cold water flows to the mainstem river. Implementation measures staff are considering to protect cold water refugia are discussed further in section 6.6.2.

6.1.5 Water Quality Restoration Plan Organization

This Water Quality Restoration Plan is organized according to the source areas identified in the peer review draft TMDL. Each section provides the load allocations and targets for that source area, presents the potential parties responsible for meeting those allocations, discusses the Regional Board staff's current approach to implementation, and in some areas provides a preliminary recommendation of implementation actions for the responsible parties. The implementation plan will be organized according to the following five source areas of allocations that were identified in the draft technical TMDL (Figure 6.1):

1. Stateline
2. Klamath Hydroelectric Project (KHP)
3. Iron Gate Hatchery
4. Klamath River tributaries
5. Watershed-wide implementation

The draft allocations and targets represent staff's findings regarding the pollutant load reductions and water quality conditions that meet water quality standards in the Klamath River in California. The allocations and targets are subject to modification based on peer review, public, and Regional Water Board comments. They are summarized before the discussion of implementation for each source area to provide context for the discussion. The rationale for the allocations and targets is provided in detail in Chapters 2 through 5 of the TMDL Staff Report. Since these allocations have not been peer reviewed, the reader is requested to withhold comments on the allocations and only comment on the implementation approach. The public will have an opportunity to comment on the technical TMDL when the public review draft is released, scheduled for June 2009.

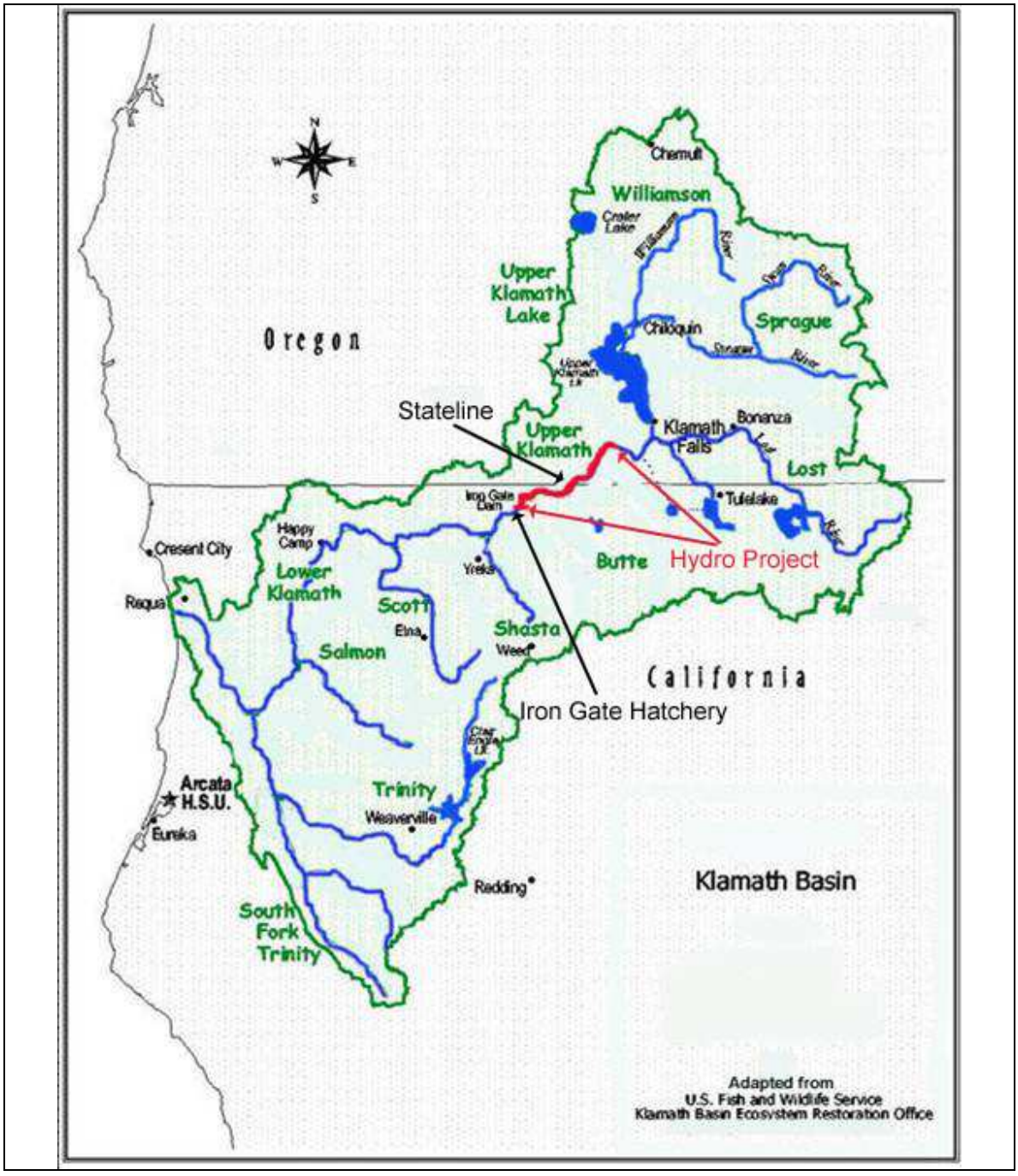

Figure 6.1: Map of Klamath Basin showing the source areas.

6.2 Stateline

The Oregon/California stateline is the point at which the Klamath River crosses the Oregon/California border and is designated as a compliance point in the Klamath TMDL. The pollutant loads in the Klamath River entering California are the result of loadings in

Oregon, including the Lost River basin, which is partially in California. The load allocations at the stateline are for temperature, nutrients and organic matter. Combined anthropogenic sources elevate temperatures in the Klamath mainstem as much as 9° F above natural baseline temperatures during the summer. The nutrient loading in the critical summer period originates mainly from Upper Klamath Lake and irrigation return flows conveyed to the Klamath River from the Lost River Basin through the Klamath Straits Drain, and to a lesser extent from point sources. Nutrients coming from sources in Oregon contribute to DO and pH swings downstream, as well as to the growth of toxic algae both within the river and within the Copco and Iron Gate reservoirs in California.

The ODEQ has identified the Klamath River in Oregon on its CWA section 303(d) list as failing to meet Oregon water quality criteria. Accordingly, in 2009, ODEQ intends to issue and implement TMDLs addressing temperature, dissolved oxygen, pH, ammonia, and chlorophyll-a impairments for the Klamath River in the state of Oregon. These Oregon-issued TMDLs will be based on Oregon's water quality standards. Because these TMDLs (and their anticipated load and wasteload allocations) are being developed by Oregon as part of a comprehensive multistate analysis of pollutant loadings to the Klamath River, they are also being designed to meet California water quality standards at the Oregon/California stateline. It is appropriate for the Regional Water Board to account for these anticipated upstream load reductions in Oregon when developing the TMDLs for the segments of the Klamath River that are downstream in California. For ease of reference, these anticipated reductions in Oregon-source loads are identified in this TMDL in California as load allocations that reflect anticipated water quality at the Oregon/California stateline once the Oregon TMDLs are fully implemented. Thus, the allocations and targets at stateline identified in Tables 1-4 reflect an understanding and acknowledgement that improvements in water quality in Oregon represent a critical part of the solution in meeting water quality objectives in California.

6.2.1 Allocations and Targets

6.2.1.1 Temperature Allocation

The allocation for temperature at stateline is zero increase above natural, in accordance with water quality objectives.

6.2.1.2 Temperature Targets

The temperature targets at Stateline are expressed as monthly average temperatures and are presented in Table 6.2.

Table 6.2: Temperature Numeric Targets (°C) at Stateline, Expressed as Monthly Averages.

May	June	July	August	September	October
13.7	17.3	18.7	18.0	14.0	9.7
November	**December**	**January**	**February**	**March**	**April**
3.9	2.6	3.4	6.2	8.8	11.2

6.2.1.3 Nutrients and Organic Matter (CBOD) Allocations

The nutrient and organic matter allocations are expressed as monthly mean concentrations (mg/L) for total phosphorous (TP), total nitrogen (TN), and organic matter (CBOD) as shown in Table 6.3.

Table 6.3: Nutrient and Organic Matter Monthly Mean Concentrations (mg/L) Allocations at Stateline. Include footnote that discusses significant digits

	May	June	July	August	September	October
TP	0.033	0.040	0.044	0.040	0.029	0.028
TN	0.353	0.418	0.434	0.406	0.230	0.265
CBOD	3	3	3	3	1	2
	November	**December**	**January**	**February**	**March**	**April**
TP	0.029	0.031	0.027	0.028	0.029	0.034
TN	0.269	0.300	0.304	0.330	0.338	0.370
CBOD	2	2	2	3	3	3

Nutrient and organic matter allocations at stateline are set to control their biostimulatory and oxygen consuming effect on DO and to control algal bloom conditions in California. Significant load reductions are necessary in Oregon to meet water quality objectives in the Klamath River in both states. Table 6.4 shows the current and TMDL compliant loadings at stateline along with the necessary load reduction expressed as a percentage of the current loading.

Table 6.4: Stateline Annual Klamath River Loads for Nutrients and Organic Matter (lbs)

	Current	TMDL	% Reduction
Total Phosphorus	756,036	124,722	84
Total Nitrogen	3,317,844	1,329,996	60
Organic Matter as CBOD	19,587,128	10,583,190	46

6.2.1.4 Dissolved Oxygen Targets

The dissolved oxygen targets at Stateline are expressed as monthly average and monthly minimum DO concentrations (Table 6.5). These dissolved oxygen targets are consistent with the DO concentrations at Stateline that achieve 85% saturation under natural temperature conditions.

Table 6.5: Dissolved Oxygen Numeric Targets (mg/L) at Stateline.

	May	June	July	August	September	October
Mean	8.6	8.2	8.2	8.2	8.9	9.7
Minimum	7.9	7.1	6.9	7.0	8.0	8.4
	November	**December**	**January**	**February**	**March**	**April**
Mean	11.2	11.5	11.1	10.2	9.5	8.9
Minimum	9.9	11.0	10.7	9.8	9.0	8.4

6.2.2 Responsible Parties

Point and Nonpoint Sources in Oregon and Lost River Basin in California
Regional Water Board
USEPA Regions 9 and 10

6.2.3 Implementation

6.2.3.1 Oregon

Consistent with Oregon Administrative Rules (OARs), ODEQ is responsible for developing an implementation plan, called a Water Quality Management Plan (WQMP), to meet the Klamath and Lost River TMDLs in Oregon. The OARs establish the required elements of WQMPs, which include the following:

- identification of management measures to meet load allocations;
- a timeline for implementation with measureable milestones;
- a timeline for attainment of water quality standards;
- a monitoring plan; and
- general discussion of costs and funding for implementation.

The OARs also require the WQMP to identify persons and agencies responsible for implementation, as well as provide reasonable assurance that implementation will occur through either regulatory or voluntary means. A main difference between TMDL implementation in Oregon and TMDL implementation in California is that ODEQ is not required to specify implementation actions for the responsible parties in the WQMP. In Oregon, it is the responsible parties that develop the 'sector or source specific' implementation plans to meet the TMDL load allocations. In Oregon, agencies designated in the WQMP as being responsible for implementation and attainment of water quality standards are called Designated Management Agencies (DMAs). The Oregon Department of Forestry (ODF) and the Oregon Department of Agriculture (ODA) are two such DMAs that are specifically mentioned in the OARs for TMDLs (OAR Division 42).

It is the Regional Water Board staff's current understanding that Klamath and Lost River TMDL implementation in Oregon will focus on controlling temperature alterations and nutrient and organic matter inputs from point and nonpoint sources to the Klamath and Lost River basins in Oregon. The Oregon Department of Agriculture is the DMA with primary authority to regulate agriculture to protect water quality with respect to these pollutants. Since ODEQ authority is secondary, it is important for ODA to effectively use its authority in order to achieve the Klamath and Lost River TMDL load allocations and targets in Oregon with oversight by ODEQ. ODA exercises its enforcement authority for the prevention and control of water pollution under various administrative rules, including rules specific to various management areas. The management areas located in the Klamath River basin in Oregon are the Klamath Headwaters Area and the Lost River Subbasin Area. Administrative rules have been adopted for agricultural activities in both of these management areas and outline the water quality requirements specific to each. Under Oregon Senate Bill 1010, landowners are required to develop Agricultural Water Quality Management Plans that implement the rules to control water pollution resulting from agricultural activities. A Local Advisory Committee (LAC) typically represents the landowners in development of both the area administrative rules and the management area plans with oversight by the Oregon Department of Agriculture. The rules are enforceable, while the plans are not.

6.2.3.2 California's Role

Regional Water Board staff intend to participate to the extent that they can in development and review of Oregon TMDL implementation, including submitting comments on any NPDES permits issued to ensure that load reductions upstream are met. Staff will be reviewing Oregon TMDL implementation in other basins to gage the efficacy and timing that can be expected for nonpoint source control. The ability of Oregon to regulate and reduce upstream sources will dramatically influence California's ability to manage water quality downstream. The Regional Water Board has signed a Memorandum of Agreement (MOA) with ODEQ and USEPA Regions 9 and 10 concerning the development of the technical TMDLs for the Klamath and Lost River basins. In addition, the Regional Water Board is working with the same parties to develop another MOA that will establish a framework for continued coordination on implementation of the Klamath and Lost River TMDLs. The MOA concerning the technical TMDLs is available at: http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/klamath_river/pdf/klamathlosttmdlsrevisedmoa.pdf

6.3 Klamath Hydroelectric Project

The Klamath Hydroelectric Project (KHP) is a federally licensed project owned and operated by the PacifiCorp company and consists of eight facilities in both California and Oregon. The implementation plan will address the impacts of the project in California, which includes the following three dam/reservoir pairs: Copco 1, Copco 2, and Iron Gate. Figure 6.2 shows all the dams on the Klamath River. All except Link River Dam are part of the KHP, and the Fall Creek Dam is located on Fall Creek, not the Klamath River.

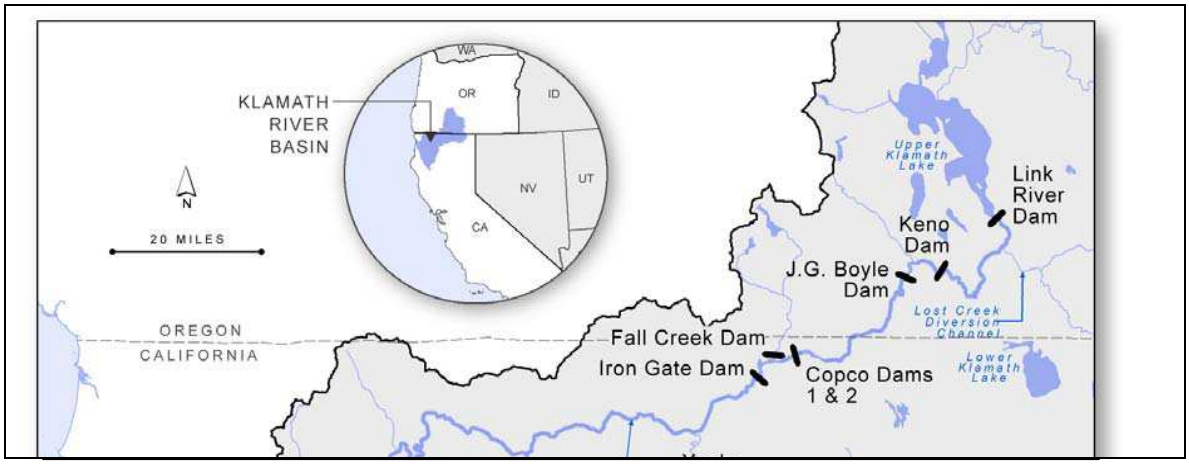

Figure 6.2: Map of Klamath Hydroelectric Project dams. Link River Dam also shown.

The technical TMDL analysis found that the KHP contributes to the impairment of the Klamath River by:

- adding and altering the timing of nutrient and organic matter loads, seasonally contributing to biostimulatory conditions in the summer/fall growing season;

- creating conditions that promote nuisance blooms of suspended algae, including toxin forming blue-green algae species;
- creating low dissolved oxygen and high temperature conditions within the reservoirs and at the tailrace; and
- altering the temperature regime in the Klamath River downstream.

The technical TMDL includes draft allocations and targets for TMDL pollutants both within the reservoirs and at the tailrace discharges.

6.3.1 Within Reservoir Allocations and Targets

6.3.1.1 Dissolved Oxygen and Temperature Allocations

The temperature and DO allocations for waters within Copco 1 and 2 and Iron Gate Reservoirs are dual allocations, wherein achievement of the water quality objective for temperature is dependent on dissolved oxygen conditions and vice versa. Allocations for dissolved oxygen and temperature are equal to a "compliance lens" within which DO and temperature conditions meet Basin Plan objectives for both water temperature and DO and are protective of COLD and MIGR[1] beneficial uses. The compliance lens concept is illustrated in Figure 6.3.

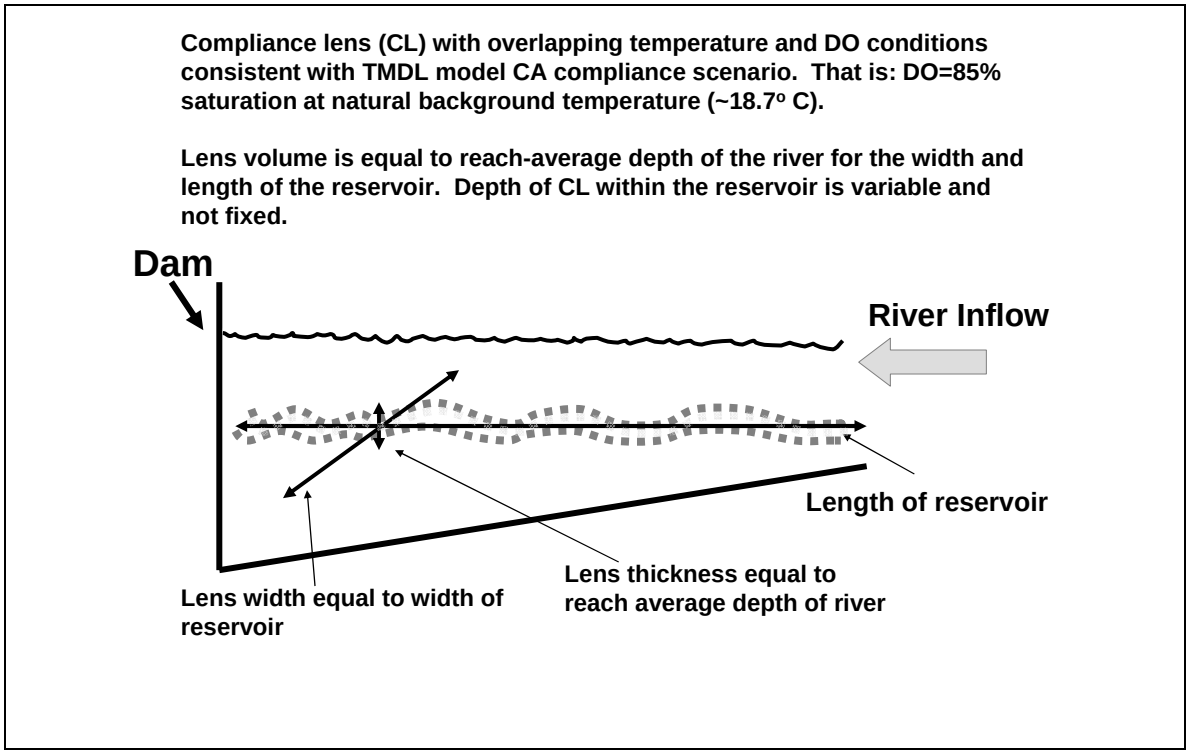

Figure 6.3: Illustrated Conceptual Model of Reservoir Compliance Lens for Temperature and Dissolved Oxygen

[1] COLD refers to the Cold Freshwater Habitat beneficial use and MIGR refers to the Migration of Aquatic Organisms beneficial use specified in the Basin Plan.

The allocation is for the critical period of May through October and requires overlapping DO concentrations consistent with 85% saturation, and temperatures consistent with natural water temperatures at the point of entry to the reservoirs within a lens throughout the reservoir.

The volume of each reservoir compliance lens is equal to the average hydraulic depth of the river in a free-flowing state for the width and length of the reservoir. The depth at which the compliance lens occurs within the reservoirs will vary. For Copco 1 and 2 and Iron Gate Reservoirs the instantaneous DO mass that achieves the DO allocation equals 39,398 pounds (7.64 mg/L) and 47,624 pounds (7.60 mg/L), respectively.

6.3.1.2 Nutrient Allocation

The reservoirs are responsible for the flux of nutrients (e.g., ammonia and orthophosphate) from sediments under anoxic conditions during the critical period May through October. The nutrient allocation for Copco 1 and 2, and Iron Gate Reservoirs is zero nutrient loading from reservoir bottom sediments.

6.6.1.3 Nutrient and Organic Matter (CBOD) Targets

Nutrient and organic matter numeric targets for mid-point locations of Copco 1 and Iron Gate Reservoirs are presented in Table 6.6.

Table 6.6: Nutrient and Organic Matter Monthly Mean Concentration Targets (mg/L) for Mid-Point of Copco 1 and Iron Gate Reservoirs.

Mid-Point Copco 1 Reservoir						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.024	0.027	0.023	0.021	0.023	0.024
TN	0.267	0.276	0.223	0.155	0.123	0.130
CBOD	1	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.023	0.025	0.028	0.025	0.024	0.027
TN	0.171	0.202	0.423	0.281	0.267	0.276
CBOD	1	1	1	2	2	2
Mid-Point Iron Gate Reservoir						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.034	0.030	0.034	0.034	0.034	0.029
TN	0.279	0.206	0.182	0.155	0.170	0.140
CBOD	2	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.028	0.002	0.038	0.035	0.035	0.044
TN	0.166	0.012	0.585	0.315	0.320	0.356
CBOD	1	0	1	3	3	3

6.3.1.4 *Microcystis Aeruginosa* and Microcystin Targets

The targets for *Microcystis aeruginosa* and microsystin are:

- *Microcystis aeruginosa* concentrations that are equal to or less than 50% of the blue-green algal biomass or 20,000 cells per liter (whichever is lower); and

- Microcystin toxin levels below 4 µg/L (World Health Organization and the California Blue-Green Algae Work Group Voluntary Guidelines).

Nutrient conditions in Iron Gate and Copco 1 and 2 Reservoirs, along with the physical conditions of the reservoirs, are associated with the formation of summer algal blooms, including the formation of extensive blooms of the blue-green algae *Microcystis aeruginosa*. Numeric targets are set for both suspended algae chlorophyll-a and nuisance blue-green algae blooms (*Microcystis aeruginosa* cell density and associated concentrations of the toxin microcystin), applicable to Copco 1 and 2 and Iron Gate Reservoirs.

6.3.1.5 Chlorophyll-a Target

Copco 1 and 2 and Iron Gate Reservoirs have a target of a growing season (May through October) average of 10 µg/L chlorophyll-a.

Chlorophyll-a concentration is an accepted indicator of algal biomass. This target addresses water quality impairments related to the biostimulatory conditions created by the reservoir environment.

6.3.2 Reservoir Tailrace Waters Allocations and Targets

6.3.2.1 Temperature Allocations

Iron Gate and Copco Reservoirs discharge elevated temperature waste that adversely affects beneficial uses. The discharge of elevated temperature waste to the Klamath River is prohibited by the Thermal Plan. Since there is no allowable temperature increase that can be allocated to the Iron Gate and Copco 1 and 2 Reservoirs, the load allocation to these reservoirs equals zero temperature increase above natural temperatures. Given that the water quality objectives for temperature do not allow for temperature increases above natural, the water released from Iron Gate and Copco 2 Reservoirs to the Klamath River are allocated temperature increases that correspond to natural temperature increases, as presented in Table 6.7. The temperature allocation is defined as the allowable temperature increase added to the in-flowing temperature of the river immediately upstream of each reservoir.

Table 6.7: Temperature Load Allocations for Reservoir Tailrace Waters

Facility	Increase in Daily Average	Increase in Daily Maximum
Iron Gate	0.1 ^{o}C (0.18 ^{o}F)	0.1 ^{o}C (0.18 ^{o}F)
Copco 1 & 2	0.3 ^{o}C (0.54 ^{o}F)	0.5 ^{o}C (0.9 ^{o}F)

6.3.2.2 Temperature Targets

The numeric temperature targets assigned to Iron Gate and Copco 2 tailraces are expressed as monthly average temperatures and presented in Table 6.8.

Table 6.8: Temperature Numeric Targets for Iron Gate and Copco 2 Reservoir Tailrace Waters, Expressed as Monthly Averages.

	May	June	July	August	September	October
Copco	14.1 °C 57.4 °F	17.7 °C 63.9 °F	19.1 °C 66.4 °F	18.4 °C 65.1 °F	14.3 °C 57.7 °F	9.8 °C 49.6 °F
Iron Gate	14.5 °C 58.1 °F	18.0 °C 64.3 °F	19.5 °C 67.1 °F	18.8 °C 65.9 °F	14.7 °C 58.4 °F	10.0 °C 50.0 °F
	November	**December**	**January**	**February**	**March**	**April**
Copco	3.8 °C 38.8 °F	2.5 °C 36.5 °F	3.3 °C 37.9 °F	6.2 °C 43.2 °F	8.8 °C 47.8 °F	11.0 °C 51.8 °F
Iron Gate	3.7 °C 38.7 °F	2.4 °C 36.3 °F	3.3 °C 37.9 °F	6.1 °C 43.0 °F	8.9 °C 48.0°F	10.9 °C 51.6 °F

6.3.2.3 Dissolved Oxygen Targets

Copco 2 and Iron Gate tailrace targets for dissolved oxygen are expressed as monthly mean and monthly minimum DO concentrations (Table 6.9).

Table 6.9: Dissolved Oxygen Numeric Targets (mg/L) for Copco 2 and Iron Gate Tailraces.

Copco 2 Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
Mean	8.7	8.3	8.2	8.3	9.0	9.8
Minimum	7.8	7.0	6.8	6.8	7.9	8.4
	November	**December**	**January**	**February**	**March**	**April**
Mean	11.4	11.7	11.3	10.3	9.7	9.1
Minimum	10.0	11.2	10.8	9.9	9.1	8.5
Iron Gate Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
Mean	8.9	8.3	8.2	8.2	9.0	9.9
Minimum	7.9	7.3	7.2	7.2	8.1	8.6
	November	**December**	**January**	**February**	**March**	**April**
Mean	11.6	11.9	11.5	10.6	9.9	9.4
Minimum	10.4	11.4	11.0	10.1	9.3	8.7

6.3.2.4 Nutrient and Organic Matter (CBOD) Targets

Copco 2 and Iron Gate tailrace targets for nutrients and organic matter are expressed as monthly mean concentrations (Table 6.10).

Table 6.10: Nutrient and Organic Matter Monthly Mean Concentration Targets (mg/L) for Copco 2 and Iron Gate Tailraces.

Copco 2 Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.025	0.025	0.028	0.030	0.025	0.022
TN	0.251	0.216	0.193	0.201	0.162	0.131

CBOD	2	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.023	0.027	0.032	0.023	0.023	0.026
TN	0.170	0.211	0.558	0.258	0.267	0.264
CBOD	1	1	1	2	2	2
Iron Gate Tailrace						
	May	**June**	**July**	**August**	**September**	**October**
TP	0.032	0.030	0.031	0.035	0.034	0.028
TN	0.276	0.225	0.202	0.198	0.176	0.135
CBOD	1	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.027	0.031	0.044	0.033	0.034	0.040
TN	0.156	0.209	0.751	0.297	0.311	0.322
CBOD	1	1	1	2	2	2

6.3.3 Responsible Parties

PacifiCorp
Federal Energy Regulatory Commission
State Water Resources Control Board

6.3.4 Implementation

To comply with the TMDL, PacifiCorp must implement management measures that result in attainment of the load allocations to the Klamath Hydroelectric Project (KHP). Regulation of the TMDL allocations is through the State Water Board water quality certification process described below, since the Regional Board is preempted from issuing a permit to the KHP. The KHP is licensed by the Federal Energy Regulatory Commission (FERC) with a license that expired on March 1, 2006. The KHP continues to operate under an annual license until renewal. Renewal of the license requires compliance with the California Environmental Quality Act (CEQA) and the issuance of a Clean Water Act section 401 water quality certification by the State Water Board. In issuing water quality certification, the state may impose conditions on the KHP in order to certify that the project protects beneficial uses and meets water quality objectives as specified in the Basin Plan. The Klamath TMDLs, upon adoption, will become part of the Basin Plan and will thus become part of the comprehensive plan that FERC must consider as part of its licensing decision. As authorized by section 401, the State Water Board will apply appropriate state water quality requirements through the FERC licensing proceeding as part of its decision to issue or deny water quality certification.

In 2004, FERC prepared a Final Environmental Impact Statement (FEIS) that describes the positive and negative environmental effects of the proposed action to relicense the continued operation of the KHP, and alternative actions, including decommissioning all or part of the project. As part of the 401 certification proceeding, the State Water Board is preparing an Environmental Impact Report (EIR) since the FEIS does not fully comply with CEQA (SWRCB, 2008). The FEIS will form the basis of the EIR, and the SWRCB has initiated the process of soliciting information from stakeholders regarding the

adequacy of the FEIS and the scope of the EIR. The EIR will evaluate four alternatives for operating the KHP, two of which include removal of two and four of the KHP dams, respectively. Regional Water Board staff will continue to participate in the FERC relicensing and 401 process at the State Water Board to provide information and consultation to ensure that the KHP meets water quality standards and other Basin Plan requirements.

The TMDL implementation plan will consider a variety of implementation options, consistent with the State Water Board and FERC process, to address reservoir-related water quality impairments. Implementation time schedule and measures may vary depending on which approach is selected. Regardless of the approach, the 401 water quality certification must incorporate conditions ensure compliance with TMDL allocations and protection of beneficial uses. This is true for the alternative that proposes continued operation of the KHP, as well as for any alternative that considers dam removal. In addition, PacifiCorp must implement adequate water quality control measures to offset on-going reservoir impacts while the reservoirs are modified to meet the load allocations or, alternatively, up to the time they are decommissioned. Regional Water Board staff are providing comments to the State Water Board on appropriate measures for the anticipated interim period.

On November 13, 2008, an Agreement in Principle (AIP) to remove four Klamath River dams was announced after negotiations between the federal government, the state of California, the state of Oregon, and PacifiCorp. The Regional Water Board was not a party to the negotiations and, as stated previously, the Klamath River TMDL is being developed to accommodate differing alternatives. The final agreement may affect the TMDL implementation schedule, which relies on the FERC relicensing process and subsequent water quality certification by the State Water Board. Staff will monitor settlement developments and may provide input to the parties on appropriate interim water quality measures. Demonstrable improvements are necessary for PacifiCorp to be on a path toward compliance with the Clean Water Act and the TMDLs. The State Water Board, Division of Water Rights, may also impose certain interim operating measures on the project. Staff invite input from the public on potential interim management measures to achieve the TMDL load allocations.

6.4 Iron Gate Hatchery

Iron Gate Fish Hatchery, owned by PacifiCorp and operated by the California Department of Fish and Game (CDFG), is the only point source discharging directly to the Klamath River in California. The hatchery discharges effluent under NPDES Permit No. CA0006688 and WDR No. R1-2000-17. The hatchery discharges to the Klamath River just downstream of Iron Gate Dam in two locations.

6.4.1 Allocations and Targets

6.4.1.1 Temperature Allocation

The temperature load allocation to the Iron Gate Hatchery equals zero temperature increase above natural temperatures.

The discharge of elevated temperature waste to the Klamath River is prohibited by the state Thermal Plan. Iron Gate Hatchery discharges elevated temperature waste when the hatchery discharge is warmer than the Klamath River. Thus, there is no allowable temperature increase that can be allocated to Iron Gate Hatchery.

6.4.1.2 Temperature Targets

The numeric temperature targets assigned to the Iron Gate Hatchery (Table 6.11) are expressed as monthly average temperatures, equal to the temperatures associated with the Klamath River downstream of Iron Gate Dam.

Table 6.11. Temperature Numeric Targets for Iron Gate Hatchery, Expressed as Monthly Averages.

May	June	July	August	September	October
14.5 °C 58.1 °F	18.0 °C 64.3 °F	19.5 °C 67.1 °F	18.8 °C 65.9 °F	14.7 °C 58.4 °F	10.0 °C 50.0 °F
November	**December**	**January**	**February**	**March**	**April**
3.8 °C 38.8 °F	2.5 °C 36.5 °F	3.3 °C 37.9 °F	6.2 °C 43.2 °F	8.8 °C 47.8 °F	11.0 °C 51.8 °F

6.4.1.3 Nutrients and Organic Matter (CBOD) Allocation

The allocations to this facility are zero net nutrient and organic matter loading. The Iron Gate Hatchery nutrient and organic matter discharge quality must equal the quality of the intake water to the facility.

6.4.1.4 Nutrients and Organic Matter (CBOD) Targets

Monthly mean nutrient (TP and TN) and organic matter (CBOD) targets are presented in Table 6.12.

Table 6.12. Nutrient and Organic Matter Monthly Mean Concentration Targets (mg/L) for Iron Gate Hatchery.

	May	June	July	August	September	October
TP	0.034	0.030	0.034	0.034	0.034	0.029
TN	0.279	0.206	0.182	0.155	0.170	0.140
CBOD	2	1	1	1	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.028	0.002	0.038	0.035	0.035	0.044

TN	0.166	0.012	0.585	0.315	0.320	0.356
CBOD	1	0	1	3	3	3

6.4.1.5 Dissolved Oxygen Targets

The DO targets for Iron Gate Hatchery discharge are monthly mean and monthly minimum DO concentrations (Table 6.13). The target concentrations are consistent with compliance DO conditions immediately downstream of Iron Gate Dam, at the point of the Iron Gate Hatchery discharge.

Table 6.13. Dissolved Oxygen Numeric Targets (mg/L) for Iron Gate Hatchery Discharge.

	May	**June**	**July**	**August**	**September**	**October**
Mean	8.9	8.3	8.2	8.2	9.0	9.9
Minimum	7.9	7.3	7.2	7.2	8.1	8.6
	November	**December**	**January**	**February**	**March**	**April**
Mean	11.6	11.9	11.5	10.6	9.9	9.4
Minimum	10.4	11.4	11.0	10.1	9.3	8.7

6.4.2 Responsible Parties

Regional Water Board
California Department of Fish and Game
PacifiCorp

6.4.3 Implementation

The load allocations to the Iron Gate Hatchery discharges will be implemented through the federal NPDES permit, which is held by CDFG. The current permit passed the expiration date in August 2004, but the hatchery continues to operate under the terms of the existing permit until a new permit is issued. The TMDL load allocations and targets to the hatchery discharge will be translated into effluent limits in the new NPDES permit. The compliance schedule adopted as part of the permit will consider the time needed for CDFG to make any infrastructure improvements to the hatchery and to implement management measures that meet TMDL allocations. Staff are considering the potential for the Hatchery to achieve some or all of their load reductions through pollutant trading with upstream dischargers.

6.5 Tributaries

The tributaries to the Klamath River include five major tributaries and numerous minor tributaries. The major tributaries refer to the Trinity, Salmon, Scott, Shasta and Lost Rivers. All the major tributaries, except the Lost River, join the Klamath River in California and are also wholly contained within California. The Lost River traverses the Oregon California border three times and ultimately discharges into the Klamath River in Oregon. The major tributaries have all had technical TMDLs completed that are specific to the tributary basin. The Regional Water Board has adopted TMDL implementation plans for the Scott, Shasta, and Salmon River basins. The Trinity, South Fork Trinity, and Lost River basins have had TMDLs completed by the USEPA, and therefore do not

have associated implementation plans. Table 6.14 provides a summary of completed TMDLs and adopted implementation plans in the major tributaries.

Table 6.14: Completed TMDLs for the major tributaries of the Klamath River Basin.

Subwatershed	TMDL(s)	Year	Agency
Lower Lost River	Nutrients and Biochemical Oxygen Demand (BOD)	Final Technical TMDL, 2008	USEPA
Shasta River	Temperature, dissolved oxygen	Final Technical TMDL and Implementation Plan, 2007	Regional Water Board
Scott River	Temperature, sediment	Final Technical TMDL and Implementation Plan, 2006	Regional Water Board
Salmon River	Temperature	Final Technical TMDL and Implementation Plan, 2005	Regional Water Board
Trinity River	Sediment	Final Technical TMDL, 2001	USEPA
South Fork Trinity River	Sediment	Final Technical TMDL, 1998	USEPA

6.5.1 Allocations and Targets

6.5.1.1 Nutrients and Organic Matter (CBOD) Allocations

The Regional Water Board's Klamath River TMDLs assign nutrient and organic matter load allocations to all the Klamath tributaries in California in order to ensure that water quality objectives in the mainstem of the Klamath River are met. The TMDL also assigns temperature allocations that apply to the entire Klamath basin in California, including the tributaries, called watershed wide allocations. The watershed-wide water temperature allocations are presented in the watershed-wide section below.

The nutrient and organic matter allocations for all Klamath River tributaries in California are monthly mean concentrations for TP, TN, and CBOD, as summarized in Table 6.15. The Shasta, Scott, Salmon, and Trinity Rivers allocations are different for the wet (November through April) and dry (May through October) seasons. The concentration based allocations for the minor tributaries apply year-round. All of these Klamath River tributary nutrient and organic matter concentration-based allocations apply at the mouths of the tributaries. For all tributaries except the Shasta River, these allocations are consistent with the current average concentrations. The Klamath River TMDL allocations to the Shasta River mouth are consistent with the nutrient and organic matter allocations assigned by the Shasta River TMDLs. Since the Lost River allocation is located in Oregon, it was not part of the administrative draft of the technical TMDL in California. It will receive an allocation in the Klamath TMDLs when the Oregon and California portions are released as a public review draft, currently scheduled for June 2009.

Table 6.15: Klamath River TMDL nutrient and organic matter seasonal monthly mean concentration allocations for tributaries to the Klamath River.

Tributary	Season	TP mg/L	TN mg/L	CBOD mg/L
Shasta River	Dry: May - October	0.071	0.21	2
	Wet: November - April	0.071	0.21	2

Scott River	Dry: May - October	0.014	0.21	4
	Wet: November - April	0.016	0.21	3
Salmon River	Dry: May - October	0.010	0.10	2
	Wet: November - April	0.020	0.10	2
Trinity River	Dry: May - October	0.020	0.10	2
	Wet: November - April	0.030	0.10	3
Minor Tribs	Year-round	0.014	0.077	1

6.5.1.2 Nutrient and Organic Matter (CBOD) Targets

Nutrient and organic matter numeric targets are also set for the Klamath River mainstem downstream of the Salmon River. The TP, TN, and CBOD numeric targets are expressed as monthly mean concentrations (mg/L) (Table 6.16).

Table 6.16: Nutrient and Organic Matter Monthly Mean Targets (mg/L) for Klamath River Below the Salmon River.

	May	June	July	August	September	October
TP	0.023	0.024	0.026	0.029	0.032	0.029
TN	0.208	0.200	0.185	0.168	0.181	0.163
CBOD	2	2	2	2	1	1
	November	**December**	**January**	**February**	**March**	**April**
TP	0.028	0.027	0.027	0.023	0.025	0.026
TN	0.161	0.170	0.333	0.181	0.199	0.208
CBOD	1	1	1	1	2	2

6.5.1.3 Dissolved Oxygen Targets

The DO target is set for the Klamath River mainstem downstream of the Salmon River immediately upstream of the boundary of the Hoopa Valley Indian Reservation (Table 6.17).

Table 6.17: Dissolved Oxygen Numeric Targets (mg/L) for the Klamath River Mainstem Below the Salmon River.

	May	June	July	August	September	October
Mean	10.0	9.1	8.5	8.4	8.9	10.0
Minimum	9.3	8.1	7.7	7.6	8.2	8.8
	November	**December**	**January**	**February**	**March**	**April**
Mean	11.7	12.4	12.3	11.8	11.4	10.7
Minimum	10.7	11.9	11.9	11.5	10.8	10.3

6.5.1.4 Periphyton Biomass Target

A periphyton biomass numeric target is also set for the Klamath River downstream of the Salmon River; a reach-averaged maximum density of 150 mg of chlorophyll-a /m^2. Periphyton are algae attached to the streambed substrate whose growth is partially controlled by nutrient concentrations in the water column.

6.5.2 Responsible Parties

- US Forest Service
- US Bureau of Reclamation
- US Bureau of Land Management
- US Fish and Wildlife Service
- Private timber companies
- Irrigation Districts
- Siskiyou, Trinity, Del Norte, Modoc and Humboldt counties
- Caltrans
- Oregon point and nonpoint sources

- Any party whose activities have the potential to contribute towards the TMDL impairments whether it be through altering riparian shade, discharging excess sediment that has the potential to cause channel alterations, or discharging phosphorus, nitrogen or organic material. The technical TMDL identified the following source categories that have this potential: grazing, irrigated agriculture, timber harvest, and roads.

6.5.3 Implementation

The Klamath implementation plan may include additional measures in any of the major tributary watersheds to meet the load allocations in the Klamath TMDL and to maintain consistency throughout the Klamath Basin. This section discusses the approach to coordinating implementation specific to each of the major tributaries given existing TMDLs and implementation plans.

6.5.3.1 Lost River

Historically, the Lost River Basin was a terminal basin, meaning it was not hydrologically connected to the Klamath River, except during extreme flow events. The Lost River became a tributary to the Klamath River when the Basin was engineered to its current configuration in the early 1900s to accommodate the development of the Klamath Irrigation Project that delivers water to approximately 200,000 acres of farmland (Figure 6.4). Of the total basin area, approximately 70,000 acres are in California, including two wildlife refuges. The Lost River today begins in California, enters Oregon, flows through the Klamath Irrigation Project in Oregon and then into the Tule Lake Wildlife Refuge in California; the historical terminus of the Lost River. To maintain dry farmland in the refuge, water that accumulates in the refuge is pumped through a tunnel into the Lower Klamath Lake Wildlife Refuge. Drainage from this refuge flows back across Oregon through the Klamath Straits Drain (KSD), which then discharges into the Klamath River in Oregon. The current loading from the KSD comprises approximately 13 percent of the total phosphorus loading, 23 percent of the total nitrogen loading, and 40 percent of the organic matter loading to the Klamath River loading at Stateline. The large pollutant loadings from the Klamath Straits Drain contribute significantly to the oxygen demand in the Klamath River through the decomposition of organic matter and the excessive growth of aquatic vegetation that is fueled by nutrients. This oxygen demand and aquatic plant growth are responsible for the dramatic swings in pH and low DO levels that impair the Klamath River system.

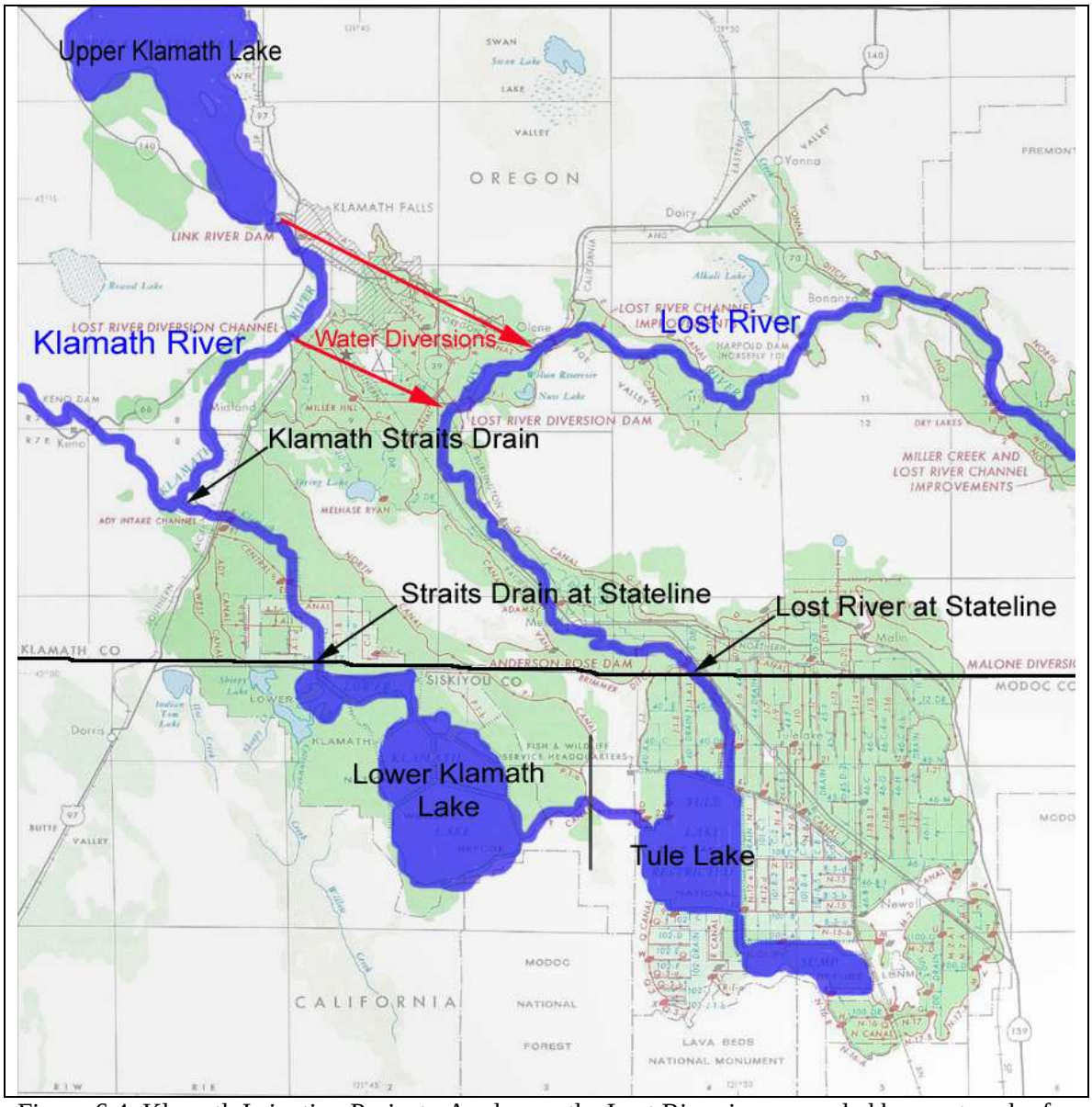

Figure 6.4: Klamath Irrigation Project. As shown, the Lost River is surrounded by a network of canals and drains that service irrigation districts. A large part of the water supply to the agricultural operations in the Lost River Basin is delivered from the Klamath River through large irrigation canals.

Manmade alterations and pollutant inputs to the Lost River Basin have contributed to water quality impairments in the following ways:

- Development of the irrigation project resulted in major losses of natural riparian and wetland areas in the Lost River.
- The historic Tule Lake, and Lower Klamath Lake areas has been reduced from roughly 200,000 acres to around 17,000 acres.
- The floodplain has been separated from the river and no longer functions as a filter for pollutants except in very high water conditions

- High nutrient and organic matter loading in the Lost River system (from water diversions, agricultural return flows, and cycling of nutrients and organic matter from water body bottom sediments) promotes the production of aquatic plants and algae

Nutrients and Organic Matter

Pursuant to obligations under a consent decree (*Pacific Coast Federation of Fishermen's Associations, et al. v. Marcus, No. 95-4474 MHP, 11 March 1997*), the U.S. EPA prepared TMDLs for impaired portions of the Lost River Hydrologic Area in California in December 2008. The Lost River TMDLs identify the maximum amount of dissolved inorganic nitrogen (DIN) and carbonaceous biochemical oxygen demand (CBOD) that can be delivered to the Lost River and still meet applicable California and Oregon water quality standards for nutrients, dissolved oxygen, and pH. The Lost River TMDL assigns load allocations to nonpoint source discharges for each modeled segment of the Lost River in California (Table 6.18). In addition, wasteload allocations are established for the two point sources: the City of Tulelake sewage treatment plant and CalTrans facility stormwater runoff.

Table 6.18: Lost River TMDLs and allocations by segment

Segment	Allocation	DIN (average kg/day)	CBOD (average kg/day)
Lost River from Stateline to Tule Lake Refuge	Lost River at Stateline	76.0	148.6
	Irrigation drainage loads	3.2	47.8
	CalTrans	0.3	0.5
Upstream to Downstream Ends of Tule Lake Refuge	Irrigation drainage loads to Tule Lake Refuge	99.0	694.0
	CalTrans	0.3	0.5
	Tulelake WWTP	2.7	9.6
Upstream to Downstream ends of Lower Klamath Lake Refuge	Load Allocation for irrigation drainage loads to Lower Klamath Refuge	10.7	107.8
	Load Allocation to Ady Canal	12.1	107.8
	CalTrans	0.3	0.5
Klamath Straits Drain Stateline Highway to Stateline	Load Allocation for irrigation drainage loads to Klamath Straits Drain	4.1	28.8

The Lost River TMDL completed by the USEPA does not address the portions of the Lost River basin in Oregon. Allocations to sources in the Lost River in Oregon will be assigned as part of ODEQ's Klamath TMDLs. One of the load allocations in ODEQ's draft TMDL is to the Klamath Straits Drain, which discharges to the Klamath River in Oregon. Discharges composed entirely from irrigated agricultural return flows are specifically exempted from the Clean Water Act NPDES permit requirements[2], thereby

[2] A lawsuit was filed against the United States Bureau of Reclamation alleging that the discharge of pollutants from Klamath Straits Drain without an NPDES permit violated the Clean Water Act. (Klamath

eliminating California's ability to participate in Oregon's regulatory oversight of this pollution source in Oregon. The California Water Code, however, provides authority to regulate discharges of waste that may not be subject to NPDES permits. In addition, compliance is required under section 313 of the Clean Water Act for federal facilities pollution control. (33 U.S.C §1323.)

Nutrient and organic matter loads from within the California portions of the Lost River basin need to be addressed to meet California water quality standards in the Klamath River at the stateline. The principal sources of water inflows to the Lost River system in California are agricultural drains that collect irrigation return flows from privately owned agricultural lands in the Klamath Irrigation Project. The drains themselves are owned by U.S. Bureau of Reclamation (BOR), but are operated by various irrigation districts that hold water delivery contracts with BOR. The KSD is owned and operated by BOR but receives pollutant inputs from irrigators upstream. Portions of Tule Lake and most of Lower Klamath Lake are currently part of the National Wildlife Refuge system and are managed by U.S. Fish and Wildlife Service (USFWS). Some refuge lands are jointly managed by BOR for agricultural use.

Regional Water Board staff are reviewing early implementation opportunities to control discharges of waste in California in the Lost River basin. Staff invite input from BOR, USFWS, irrigation districts and other appropriate parties in the Lost River basin. Specifically, staff are interested in any efforts currently underway to reduce pollutant loading to the Lost River, what monitoring tools are available, what tools and resources are available to individual landowners to provide effective control over runoff, and what is the most effective way to regulate discharges of waste in the Lost River basin. Also see the section on alternative approaches to reducing pollutant loads at the end of this document for information on potential pollutant trading scenarios and centralized treatment options, which could be an important part of restoration efforts in the Lost River basin.

Temperature

The Lost River is not listed on the state 303(d) list of impaired waters for water temperature and therefore the TMDL analysis did not consider the affect of water temperature in the Lost River on the Klamath River at Stateline. Although meeting the watershed-wide allocations is necessary to meet the water temperature objective in the Lost River basin in California, staff are not currently considering early implementation in the Lost River to meet the Klamath temperature allocations.

6.5.3.2 Shasta River

The Shasta River is listed on the state 303(d) list for DO and temperature and the Regional Board adopted a TMDL Action Plan for the Shasta River in June 2006 that included implementation measures.

Forest Alliance et. al v. US Bureau of Reclamation (Civil No. 97-3090-CO), United States District Court Oregon.) We do not know the status of the litigation.

Nutrients and Organic Matter

Shasta River implementation addresses nutrient sources to improve dissolved oxygen and meet the TMDL. The Action Plan included a conditional waiver for discharges of nutrients and impacts to temperature for those parties that comply with the Action Plan measures. The Klamath TMDL analysis found that the load reductions called for in the Shasta River TMDL are sufficient to meet water quality objectives in the Klamath mainstem. Overall, for nutrients, the Shasta River TMDL implementation plan measures should be sufficient to meet Klamath River load allocations.

Temperature

The Shasta River TMDL allocation for temperature related to riparian shade matches the Klamath TMDL allocation. Sediment was not identified in the Shasta technical TMDL as contributing to impacts on temperature. The Shasta River TMDL includes a goal to increase dedicated instream cold water flows by 45 cubic feet per second (CFS). Attainment of the Klamath River temperature TMDL, and associated temperature standards, requires achieving the Shasta River flow goal. Meeting the watershed wide load allocations for temperature in the Shasta River Basin, along with implementation of the Shasta River TMDL, should be sufficient to control impacts to temperature in the Klamath River.

6.5.3.3 Scott River

The Scott River is listed on the state 303(d) list for dissolved oxygen and temperature and the Regional Board adopted a TMDL Action Plan for the Scott River in December 2005 that included implementation measures. Numeric sediment allocations were given to specific sources such as road-related gullies and mining related landslides.

Nutrients and Organic Matter

The Scott River is not listed as impaired by nutrients. The Klamath River TMDL found that the current nutrient and organic matter loading to the Klamath from the Scott River is consistent with meeting water quality objectives in the Klamath River. The sediment implementation measures required by the Scott TMDL Action Plan should be sufficient to maintain the current nutrient loading to the Klamath River.

Temperature

The load allocation related to riparian shade in the Scott River TMDL matches the watershed Klamath TMDL allocation; however the shade potential is given as a numeric value that is specific to stream reaches in the watershed. While there is no sediment related temperature allocation as in the Klamath TMDL, it is expected that this allocation will be met through reductions in sediment loads that result from the Scott River sediment TMDL implementation measures.

6.5.3.4 Salmon River

The Salmon River is listed on the state 303(d) list for temperature and the Regional Board adopted a technical TMDL in June 2005. The USFS manages 97% of the land in the Salmon River Basin and the Regional Board passed a resolution to develop an MOU with the USFS that would implement the Salmon River TMDL. The MOU is scheduled

for signature by xx, before adoption of the Klamath TMDLs. In addition to the MOU, Regional Board staff are in the process of developing a conditional waiver or WDRs to address all water quality impacts on federally managed lands in the Region. This waiver/WDR would incorporate implementation measures agreed upon in the MOU and put the Regional Board and USFS in compliance with the State Nonpoint Source Policy.

Temperature

The Salmon River TMDL temperature allocation related to riparian shade matches the Klamath TMDL allocation. While the Salmon River TMDL identified sediment inputs and debris torrents as potentially increasing stream temperatures in the basin, there was no allocation given to sources of sediment and no associated implementation measures. The implementation plan for the Salmon River TMDL focuses on protecting USFS 'Riparian Reserves' and meeting the riparian shade allocation. The measures needed to meet the watershed wide sediment related temperature allocation identified in the Klamath TMDL should be included in the Salmon River TMDL MOU and the USFS permitting mechanism currently under development.

Nutrients and Organic Matter

The Salmon River is not impaired by nutrients and the Klamath River TMDL found that the current nutrient and organic matter loadings to the Klamath from the Salmon River are consistent with meeting water quality objectives in the Klamath River. Sediment control should effectively control nutrients because this is the most likely source in the watershed. There are currently no implementation actions identified that address sediment but will be included as part of the MOU with the USFS as well as in the permitting mechanism currently under development

6.5.3.5 Trinity River

The Trinity River is listed on the state 303(d) list for sediment and temperature in the South Fork Trinity River and for sediment in the mainstem Trinity. The USEPA completed the South Fork sediment TMDL in 1998 and the mainstem Trinity TMDL in 2001. Load allocations to reduce sediment were given for different subareas within the basin. The temperature TMDL for South Fork has yet to be developed. The Klamath TMDL analysis found that the current effect of Trinity River temperatures and nutrient and organic matter loadings on Klamath River water quality is consistent with meeting water quality objectives. The analysis used flows for the Trinity River that were specified in the Trinity River Record of Decision; signed by the US Secretary of the Interior and the Hoopa Valley Tribal Chairman. The TMDL analysis made a preliminary finding that these flows are necessary to meet water quality objectives for water temperature in the mainstem Klamath River.

Temperature

One of the recommendations made by the USEPA was to control sediment through landowner management plans, similar to the approach being considered in the Klamath implementation plan to meet the watershed wide allocation that addresses the impacts of sediment on temperature. The plan should also include measures to meet the riparian

shade temperature allocation in the South Fork Trinity River, since it is temperature impaired.

Nutrients and Organic Matter

The Trinity River is given a nutrient allocation in the Klamath TMDL but no loading reductions are required. Sediment control in the Trinity Basin should effectively control nutrients because this is the most likely source in the watershed. While sediment TMDLs have been completed in the Trinity, there is currently no RWQCB approved implementation plan. Controlling sediment to meet the watershed wide temperature allocation in the Klamath TMDL should be sufficient to address the sediment impairments in the Trinity River Basin.

Trinity River Restoration Program

The Trinity River Restoration Program (TRRP) is a management program, headed by the Department of the Interior, to restore the fish and wildlife populations in the Trinity River Basin to levels which existed prior to construction of the Trinity and Lewiston dams. The goals of the TRRP are consistent with Klamath River TMDLs and will be coordinated with Klamath implementation to meet the watershed wide and tributary allocations in the Trinity River Basin.

6.6 Watershed-wide Implementation

The geographic scope of the Klamath River TMDL implementation plan includes the entire Klamath River Basin from the OR/CA border to the Pacific Ocean. There are five major tributaries in California and many smaller tributaries that all have the potential to impact water quality conditions in the Klamath River. This section discusses the approach to implementation that staff is considering to meet these watershed-wide allocations and targets and the nutrient and organic matter concentration-based allocations detailed in Section 7.0 above. Implementation is discussed in relation to both the land use source categories identified in the TMDL analysis as well as other categories that were identified as part of the implementation planning process.

6.6.1 Allocations and Targets

6.6.1.1 Riparian Shade Allocation

Regional Water Board staff find that the load allocation for excess solar radiation assigned in previous temperature TMDLs approved for impaired waterbodies in the North Coast Region is also an appropriate allocation for excess solar radiation in the Klamath River basin in California. The load allocation for solar radiation is expressed as its inverse: shade. The load allocation is the shade provided by topography and full potential vegetation conditions at a site, with an allowance for natural disturbances such as floods, wind throw, disease, landslides, and fire.

6.6.1.2 Riparian Shade Targets

The targets for riparian shade are expressed as effective shade. Effective shade is a measure of the percentage of total daily direct beam solar radiation that is blocked by

vegetation or topography before reaching the ground or stream surface, and takes into account the differences in solar intensity that occur throughout a day. The technical TMDL provides effective shade curves that graphically present the levels of effective shade that are expected to naturally occur for a given type of vegetation, aspect, and stream width for streams in the Klamath Basin. These curves constitute the numeric targets for riparian shade within the Klamath River in California.

6.6.1.3 Excess Sediment Allocation

Regional Water Board staff find that stream temperature increases in the Klamath River watershed cannot be accommodated without adverse effects to beneficial uses. Therefore, stream temperature increases that result from human-caused discharges of sediment constitute an exceedance of the water quality objective for temperature. Accordingly, the load allocation equals zero temperature increase caused by substantial human-caused sediment-related channel alteration. The following definition is used to define substantial human-caused sediment-related channel alteration:

> A human-caused alteration of stream channel dimensions that increases channel width, decreases depth, or removes riparian vegetation to a degree that alters stream temperature dynamics and is caused by a increased sediment loading.

6.6.1.4 Excess Sediment Targets

There is an instream target associated with the allocations related to substantial human-caused sediment-related channel alteration:

> 0 miles of substantial human-caused sediment-related channel alteration.

There is also a watershed-wide target for stream crossings with diversion potential or significant failure potential:

> <1% of all stream crossings divert or fail as a result of a 100-year or smaller flood.

Finally, there is a watershed-wide target associated with road-related landslides:

> Decreasing trend.

6.6.2 Thermal Refugia

While there are no allocations or numeric targets set for thermal refugia, the implementation plan will address impacts to these areas and recommend actions to preserve their function in the Klamath River watershed. Summer thermal refugia are typically identified as areas of cool water created by inflowing tributaries, springs, seeps or through upwelling hyporheic flow, and groundwater in an otherwise warm stream channel. Belchik (2002) writes: "During the summer season, mainstem Klamath River water temperatures often exceed published values for chronic and acute temperature stress for salmonids." There are several cool water tributaries that create thermal refugia

as they enter the mainstem Klamath River. Because of the high temperatures in the mainstem that are stressful to salmonids, determined in the technical TMDL to occur even under natural conditions, thermal refugia play an important role in supporting beneficial uses associated with salmonid species. Fish surveys by the Yurok Tribal Fisheries Program in 1997, 1998, and 2002 have shown that salmonids in the mainstem Klamath River utilize thermal refugia to escape elevated river temperature during the day only to enter the mainstem at night when the river cools. Refugia in the Klamath Basin are found in the plumes of cold water entering the mainstem, in cool water pools fed by tributaries, or in the tributary streams themselves. The shape and extent of refugia are dependent on stream geomorphology, riparian canopy, sediment dynamics and flow.

The Klamath implementation plan may recommend actions for responsible parties that maintain and restore the function of thermal refugia by protecting water quality in the tributary watersheds. The majority of the actions would be the same as those required to meet the watershed wide temperature allocations. The streamside shade related temperature allocation requires maintenance of cool water temperatures in the tributaries. The temperature allocation related to human caused channel alteration is intended to restore and maintain natural geomorphology the can affect both water temperature and the shape of the refugia. This allocation also addresses access to refugia by minimizing channel aggradation. The specific actions necessary to meet the load allocations are described in the sections of the implementation plan that address land use activities in the Klamath Basin.

In addition to land use related actions, it may be necessary to provide further protections in the immediate area surrounding thermal refugia to prevent disturbance to their critical function in mitigating elevated mainstem temperatures. To this end, Regional Board staff are considering the establishment of a buffer in and around the mouths of tributaries that provide these refugia. Staff may also recommend that certain tributaries be considered a priority for watershed restoration on both public and private lands. Regional Board staff would appreciate information regarding the identification of tributaries that provide thermal refugia, the location of other refugia, and fish use of refugia in the Klamath Basin.

6.6.3 Responsible Parties

- US Forest Service
- US Bureau of Reclamation
- US Bureau of Land Management
- US Fish and Wildlife Service
- Private timber companies
- Irrigation Districts
- Siskiyou, Trinity, Del Norte, Modoc and Humboldt counties
- Caltrans
- Any party whose activities have the potential to contribute towards the TMDL impairments whether it be through altering riparian shade, discharging excess

sediment that has the potential to cause channel alterations, or discharging phosphorus, nitrogen or organic material. The technical TMDL identified the following source categories that have this potential: grazing, irrigated agriculture, timber harvest, and roads.

6.6.4 Implementation

This section discusses implementation to address impacts of the land use source areas identified in the Klamath technical TMDL:

- Timber Harvest
- Grazing
- Roads
- Irrigated Agriculture

The implementation plan will require the control of impacts from these activities wherever they occur throughout the entire Klamath Basin in California, including the tributary watersheds. The goal of implementation in these areas is to meet the watershed wide allocations for temperature and the tributary allocations for nutrients and organic matter. The discussion of each land use source area below explains the Regional Water Board's current regulatory strategy, as well as ongoing efforts to address the water quality impairments. Implementation to control the impacts of timber harvest and grazing on federally managed lands is discussed separately at the end of this section since the existing regulatory process differs significantly from the process on nonfederal lands. At the end of each section, staff have provided potential implementation actions for consideration by the reader. The reader is invited to provide comments on the suggested approach as well as suggestions for further or alternative actions to control impacts from that source area.

6.6.4.1 Timber Harvest on Nonfederal Lands

Timber harvest activities can substantially impact water temperature and can also impact the concentration of dissolved oxygen and nutrients. Implementation will focus on controlling sediment and protecting riparian functions from timber harvest activities to meet the watershed-wide TMDL allocations. Timber harvest on nonfederal lands is currently regulated through a combination of general WDRs (Order No R1-2004-0030) and conditional waivers of WDRs (Order No R1-2004-0016). The existing general WDRs contain a requirement that all provisions of the Basin Plan must be met to qualify for enrollment in the WDRs. By amending the Basin Plan through adoption of the Klamath River TMDL implementation plan, the existing general WDRs will ensure compliance with the TMDL load allocations. However, as it is written, the existing conditional waiver does not provide adequate assurance that temperature load allocations will be met. The existing waiver expires in June 2009, and it will be revised for renewal by the Regional Water Board.

Timber harvest on nonfederal lands is also subject to the requirements of the California Department of Forestry and Fire Protection *Forest Practice Rules* (FPRs), including the temporary *Threatened and Impaired Rules* (rules that are periodically considered for

renewal by the Board of Forestry and Fire Protection for watersheds, such as the Klamath, where populations of anadromous salmonids that are listed as threatened, endangered, or candidate under the State of Federal Endangered Species Act are currently present or can be restored). While Regional Water Board staff support the FPRs as consistent with TMDL implementation in some areas, additional measures will most likely be necessary to meet the load allocations. These measures may include additional protections for Class III streams to prevent the discharge of excess sediment, or maintenance and restoration of riparian vegetation to meet temperature standards on Class II streams. Regional Water Board staff are also considering whether to include certain FPRs that meet TMDL requirements in the Klamath River implementation plan thereby making them enforceable through Regional Water Board permits regardless of any future revisions to the FPRs. The reader is encouraged to recommend appropriate implementation measures that will ensure watershed allocations are met by responsible parties conducting timber harvest activities.

Finally, the implementation plan will describe TMDL implementation measures that should be incorporated into ownership-wide WDRs for large private timber landowners operating in the Klamath Basin in California including Green Diamond Resource Company, Fruit Growers Supply Company, Timber Products Company, and Sierra Pacific Industries. Currently, staff are in the process of developing ownership-wide WDRs for Green Diamond that will address all discharges of waste on their lands. TMDL measures will be incorporated into these WDRs.

Potential Implementation Actions

Revise conditional waiver (Order No R1-2004-0016) to ensure compliance with TMDL load allocations. Include specific FPRs as part of the Klamath River TMDL implementation plan for consistency with the existing timber harvest process. Work with timber companies (at their request) to develop ownership-wide WDRs that are compliant with the TMDL load allocations.

6.6.4.2 Grazing on Nonfederal Lands

Grazing activities in the Klamath Basin have the potential to contribute towards the TMDL impairments mainly through erosion, alteration of riparian functions, and inputs of nutrients. Grazing on nonfederal lands occurs mostly around the mouths of tributaries to the upper middle reach of the Klamath River. The Regional Water Board currently does not have a regionwide program for the regulation of nonpoint source pollution from grazing activities, unless a particular operation is classified as a concentrated animal feeding operation (CAFO). Staff are developing a region-wide permit system for dairies and CAFOs. Some CAFOs are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Water Board that acts as the USEPA designated state permitting authority. Impacts from grazing are addressed in the Scott and Shasta River basins through a conditional waiver of waste discharge requirements that requires participation in an effective TMDL compliance program. The Shasta River TMDL implementation plan includes measures that address nutrient and temperature impacts, but it does not address sediment. While the Scott River TMDL

implementation plan addresses sediment and temperature, it does not include measures to control nutrients. To comply with the Nonpoint Source Policy, the implementation plan must fill these gaps in regulation in the Klamath River by recommending a waiver, a prohibition, or waste discharge requirements to control the currently unregulated sources of pollution related to grazing. The regulatory mechanism will require compliance with the watershed-wide allocations for temperature as well as the tributary nutrient and organic matter allocations.

Staff are considering recommending a conditional waiver of waste discharge requirements or general waste discharge requirements to control all sources of pollution from grazing activities on private lands that will effectively implement the Klamath TMDL. Upon adoption, this waiver or WDRs would take the place of the Scott and Shasta River TMDL waivers for grazing activities. To meet the Klamath River and tributary load allocations, responsible parties would need to implement measures that control impacts to riparian vegetation that provides shade, sediment sources, and the discharge of nutrients and organic matter. The implementation plan will recommend that responsible parties develop a water quality management plan to comply with the TMDL; either stand-alone or as part of an existing ranch plan. Water quality planning includes elements such as:

- a description of the beneficial uses that are potentially affected on the ranch or downstream by grazing activities
- a survey of sediment sources on the ranch and a time schedule for implementing measures to address those sediment sources
- an inventory of riparian vegetation conditions and a plan to monitor progress towards meeting the watershed-wide temperature allocation regarding shade potential

Potential Implementation Action

Develop a general WDR or conditional waiver of WDRs for grazing activities in the Klamath Basin for Regional Board consideration. The waiver would require compliance with the existing TMDL load allocations in the Scott and Shasta Basin in addition to the watershed-wide and nutrient allocations in the Klamath Basin.

6.6.4.3 Roads

Roads contribute to the water temperature impairment in the Klamath Basin through delivery of sediment and impacts to riparian functions. The purpose of the road management section of the implementation plan is to control these impacts by requiring the implementation of effective management measures that meet the watershed-wide TMDL allocations. The parties responsible for the maintenance, construction, and decommissioning of roads in the Klamath Basin include the USFS, BLM, private timber companies, state, counties and private landowners. Private, federal, state and county roads are addressed separately because of differences in the potential method of regulation, i.e. waivers, WDRs, and prohibitions. Also, certain road construction projects

are required to comply with the terms of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity. This permit applies to construction projects that disturb over one acre of land. It does not apply to roads constructed as part of silvicultural or agricultural activities, unless the road is part of a land use conversion project.

Regardless of the method of regulation or the responsible party, the requirements for controlling sources of sediment from roads are similar and implementation will potentially focus on the following process:

1. Inventory: Identify sources of excess sediment discharge or threatened discharge and quantify the discharge or threatened discharge from the source(s).
2. Prioritize: Prioritize efforts to control discharge of excess sediment based on, but not limited to, severity of threat to water quality and beneficial uses, the feasibility of source control, and source site accessibility.
3. Schedule: Develop a schedule to implement the cleanup of controllable sediment discharge sites.
4. Implement: Develop and implement feasible sediment control practices to prevent, minimize, and control the discharge.
5. Monitor and Adapt: Use monitoring results to direct adaptive management in order to refine excess sediment control practices and implementation schedules until discharges are reduced to a level that meets the TMDL load allocations and water quality standards.

This process is consistent with the Regional Board's draft sediment control policy (Measures to Control Excess Sediment) as well as the Erosion Control Plans that are required by the general WDRs for timber harvest on non-federal lands. The implementation will recommend either a WDR, waiver, or prohibition for discharges from all roads in the Klamath Basin that aren't already regulated through an existing mechanism. Staff are currently working on permits for federal roads and county roads and TMDL requirements will be incorporated into those permits. Staff are also considering requiring responsible parties to reduce their road networks so they can be maintained at a level that controls the discharge of excess sediment and meets the sediment related temperature allocation.

The private timber companies, USFS, and counties, with many miles of roads to maintain, are currently implementing road treatments in a prioritized fashion. The following efforts, among others, can be coordinated with TMDL implementation:

a. Green Diamond Resource Company is implementing sediment source controls on a time schedule through their Aquatic Habitat Conservation Plan
b. The USFS has completed a significant number of watershed sediment source surveys and is implementing control practices according to the USFS Road Management Policy (2001)
c. Counties in the Klamath Basin have formed the Five Counties Salmonid Conservation Program whose program objectives include: "identify(ing) potential

problem sites through systematic inventories of fish passage barriers and potential erosion sources on County maintained roads." (5C Program website, 2009)

d. Implementation of the California Department of Transportation (Caltrans) statewide stormwater permit and sediment source mitigation efforts for state roads.
e. Issuance of Waste Discharge Requirements to the County of Siskiyou for their road maintenance and construction activities.

Potential Implementation Actions

- Develop WDRs, waivers, or prohibitions for Regional Board consideration to control the impacts of roads and meet TMDL load allocations. The regulatory mechanism would require identification of sediment sources and implementation of appropriate management practices on a time schedule.
- Develop a long term road management and maintenance plans for ownerships within the basin.
- Decommission roads on a prioritized schedule to reduce the road network to a level that can be maintained and meet the sediment related temperature load allocation.

6.6.4.4 Irrigated Agriculture

Activities associated with irrigated agriculture have the potential to degrade water quality mainly through discharges of irrigation tailwater. The majority of the water quality concerns can be related to excess nutrient inputs due to agriculture in the Upper Klamath Basin including the Lost River Basin on both sides of the California/Oregon border. However, there is also irrigated agriculture in the middle Klamath area, in the Scott and Shasta River watersheds, and in small tributary watersheds such as Bogus Creek, Cottonwood Creek, and Willow Creek.

To control impacts from agricultural activities, the implementation plan will focus on measures to control the degradation of riparian vegetation consistent with the watershed-wide temperature allocation and control nutrient discharges in tailwater consistent with the tributary nutrient allocation. Currently, with the exception of the Scott and Shasta watersheds, the Regional Board does not have an enforceable mechanism to regulate nonpoint source pollution from tailwater return flows or impacts to riparian function associated with irrigated lands. To comply with the State NPS Policy, staff are considering recommending the development of a permit (WDRs/conditional waiver) for activities associated with irrigated agriculture, including irrigated pastures used for grazing. The permit would require dischargers, either individually or as a group, to implement management measures and monitor their effectiveness in improving water quality. Irrigated lands waiver program are currently administered by the Regional Boards in the Central Coast (Region 3) and Central Valley (Region 5) Regions of California to control water quality impacts from irrigated agriculture in their respective regions. A waiver program for irrigated lands in this region would maintain regulatory consistency among irrigated agriculture communities in California and ensure adequate and timely implementation. This approach would also be consistent with the approach in the Shasta River TMDL implementation plan, where irrigators are required to submit

annual reports on tailwater return flow management actions taken to comply with the waiver associated with that TMDL. Some irrigators in the Klamath Basin have already formed third party groups to represent landowners and develop watershed management plans. One such group is the Upper Mid Klamath Watershed Council that is currently working on a plan for the Bogus Creek watershed.

Potential Implementation Actions

Develop WDRs and/or conditional waiver of WDRs for Regional Board consideration for activities associated with irrigated agriculture, including irrigated pastures used for grazing. The waiver or WDRs would consider the existing load allocations in the Shasta and Scott River Basin TMDLs and would take the place of the waiver for irrigated agriculture adopted to implement the TMDL in those Basins.

6.6.4.5 TMDL Implementation on Federally Managed Lands

The US Forest Service (USFS) and the US Bureau of Land Management (BLM) both manage public lands in the Klamath River Basin; constituting approximately two thirds of the Basin in California. The implementation plan will focus on controlling impacts from USFS activities since they manage the majority of federal lands in the Klamath Basin. There are three National Forests within the scope of the implementation plan; Six Rivers National Forest, Klamath National Forest, and Shasta-Trinity National Forest. Land use activities on USFS lands that generate TMDL pollutants include, but are not limited to, timber harvest, grazing, recreation, hard rock mining, suction dredge mining and road management.

The USFS follows several policy documents and administrative rules in its management of federal lands that must be integrated with TMDL implementation. The guiding policy for USFS compliance with California water quality standards is the *Water Quality Management for Forest System Lands in California, Best Management Practices* guidance document. The *Northwest Forest Plan* standards and guidelines, and the *Aquatic Conservation Strategy,* other USFS policy documents, also contain measures to protect water quality. The National Forests have incorporated this policy direction into their forest level *Land and Resource Management Plans*. While Regional Board staff support these policies as viable implementation vehicles, there is also an expectation that these plans be revised as necessary to comply with the TMDL.

Regional Board WDRs and/or waivers are the primary tools used to implement the TMDL load allocations on USFS lands. The Regional Board is currently working with the USFS to develop either WDRs or conditional waivers of WDRs for all activities on USFS lands. This work may be done on the regional or forest-level scale and TMDL requirements will be incorporated into the any proposed waivers or WDRs. A more detailed discussion that considers compliance related to timber harvest and grazing activities is provided below, although all federal management activities will need to meet the TMDL load allocations. TMDL measures related to road management on federal lands were discussed earlier in the Roads section.

Timber Harvest on Federally Managed Lands

Currently, the Regional Board regulates timber harvest on federally managed lands through a conditional waiver of waste discharge requirements (Order No R1-2004-0015). This waiver expires in March 2009 and will be revised for renewal by the Regional Water Board in April 2009. To be eligible for the waiver, the USFS must include practices from the *Water Quality Management for Forest System Lands in California, Best Management Practices* guidance document as part of the proposed timber harvest project. Regional Board staff support the management practices and performance standards identified in this document, however, additional measures may be needed to meet the TMDL allocations. Currently, the waiver requires compliance with the TMDL by conditioning the waiver on compliance "with all requirements of applicable water quality control plans". This refers to the Regional Board's Basin Plan, which will include the Klamath River TMDL Action Plan and load allocations upon adoption. In this way, the waiver requires compliance upon adoption; however, when the waiver is renewed, further requirements may be included.

Grazing on Federally Managed Lands

On federally managed lands within the Klamath Basin, grazing typically takes place in the Klamath National Forest on designated grazing allotments. The allotments have been in use since the early 1900's and are mostly located in high mountain meadows closer to the headwaters of Klamath River tributaries. Currently, the Klamath National Forest (KNF) is the only federal forest that manages grazing activities on federal lands within the Klamath River basin besides the allotments in the Klamath tributaries. Grazing is currently managed through the development and implementation of individual Allotment Management Plans (AMPs). Every year, the USFS develops Annual Operating Instructions (AOIs) for each allotment to implement the AMPs based on the current conditions of the allotment. Ranchers grazing animals on federal lands are required to follow the AOIs as well as meet the overall AMP objectives in order to continue grazing the allotment. The management practices that are included in the AMP are determined by an Interdisciplinary Team following an onsite evaluation of the project area. The practices are consistent with the USFS policy documents described earlier. Staff are supportive of this process as a means to meet the TMDL allocations as long as the AOIs are effective and enforceable.

Potential Implementation Action

Continue discussion with USFS on permit mechanism (e.g. WDRs/waiver) and scope (e.g. pollutants and activities) and extent (e.g. acreage under one permit). Regulate all actions on USFS lands in the Klamath Basin that have the potential to impact water quality through a permits or waivers that include TMDL compliance measures.

6.6.5 Other Source Categories

The Klamath River TMDL implementation plan must address all sources of pollution that have the potential to adversely impact water quality in the Klamath Basin. This section includes a discussion of source categories identified by staff during the development of the implementation plan that were not identified in the source analysis but may contribute toward the impairments in the Klamath Basin. The reader is encouraged to provide comments on the necessity of addressing these sources, effective approaches to

implementation, and any other sources that may need to be addressed in the Klamath Basin. As in the previous section, Regional Board staff have provided some potential implementation actions being considered thus far.

6.6.5.1 Suction Dredging

The State Water Board is currently working cooperatively with the California Department of Fish and Game (CDFG) to formulate general statewide regulations and/or guidelines for dredge operators to comply with during dredging activities. Existing research is limited and provides conflicting opinions and conclusions regarding the effects of suction dredging on the beneficial uses associated with the cold water fishery. There is general agreement, however, that suction dredging operations may cause sediment waste discharges and alter thermal regimes on a localized scale. Some potential impacts include: streambed and bank destabilization, changes to surface substrate composition, replacement of natural spawning gravels by unstable dredge tailings, destruction and/or redistribution of existing spawning riffles, and impacts to thermal refugia when dredging occurs near cool springs and tributary streams. In addition to implementing the watershed-wide temperature allocations, Regional Board staff are considering limiting suction dredging in the Klamath River Basin to certain times and locations in order to protect thermal refugia that mitigate water temperatures that are stressful to salmonids. The reader is encouraged to submit information concerning the impacts of suction dredging on thermal refugia, water temperature, and dissolved oxygen and also propose implementation measures to control these impacts.

Potential Implementation Actions

- Include recommended actions forthcoming from the CDFG and SWRCB task force in the Klamath implementation plan.
- Limit time and locations of suction dredging to prevent impacts to thermal refugia function in the mainstem Klamath River.

6.6.5.2 Individual and Small Community Wastewater Collection Systems

There are numerous onsite wastewater treatment systems (OWTS) treating wastewater from households, campgrounds, and many commercial facilities along the Klamath River mainstem and several tributaries. There are also four State permitted small wastewater treatment systems operating under WDRs adopted by the Regional Board. These treatment systems are intended to discharge to land and are therefore not given any TMDL load allocations. However, they may be considered in the implementation plan because of their potential to discharge if no operated according to the terms of their WDRs or Basin Plan policy.

The Regional Water Board has deferred authority to Del Norte, Humboldt, Siskiyou, and Modoc counties (Counties) within the Klamath watershed in California for the issuance of new permits and also assuring that presently installed OWTS are functioning properly. All of the counties, at a minimum, must adhere to the criteria and/or guidelines in the Basin Plan's *Policy on the Control of Water Quality with Respect to On-Site Waste*

Treatment and Disposal Practices (Policy) for the construction, siting, consideration of soil and bedrock conditions, etc., when issuing OWTS permits. The counties, with Regional Water Board approval, are also free to implement regulations and guidelines that are more protective of water quality than in the Policy. The Regional Water Board will follow the criteria in the Policy until the State Water Resources Control Board (SWRCB) drafts and implements statewide OWTS regulations as required under Assembly Bill 885 (AB 885).

There are four State permitted small wastewater treatment systems operating under WDRs along the Klamath River: the Klamath River Resort near Hornbrook (Oder No. R1-2006-0085), the Happy Camp Sanitation District in Happy Camp (Order No. 98-2), a small US Forest Service facility in Orleans (Order No. 97-10-DWQ), and a small wastewater treatment system in the community of Klamath (Order No. 84-118).

The Klamath River Resort's and the U.S. Forest Service's wastewater treatment systems are operating properly and not considered a threat to water quality, therefore, periodic, regularly scheduled inspections and evaluations are all that are deemed necessary to assure their compliance with each system's respective WDRs. The Happy Camp Sanitation District system is over 30 years old but is considered to be operating without any threats to water quality. However, staff may recommend, because of its age, that a thorough facility inspection be conducted to evaluate if there is a threat of discharge to waters of the Klamath River.

The Klamath Community wastewater treatment system was issued Cease and Desist Order No. 94-118 (Order) after the New Year's Day flood of 2006 eroded and rendered useless one of the systems leachfields adjacent the Klamath River. Regional Water Board staff are presently working with the Klamath Community Services District to comply with the Order, and reconstruct the damaged leachfield. The continued administration of the Order No. 94-118 will be included as an action in the Implementation Plan.

6.6.5.3 Hardrock Mining

There are two traditional hard rock mines, now abandoned, known to have presented a threat to water quality to tributaries of the Klamath River. The Siskon Mine is an abandoned gold and silver mine located approximately 16 air miles northwest of Somes Bar along Copper Creek, tributary to Dillon Creek, thence the Klamath River. The other abandoned mine is the Gray Eagle Mine; a former copper mine that last operated during World War II. This mine is located approximately 5.5 air miles north of Happy Camp near the headwaters of Luther Gulch Creek; which is a tributary to the Klamath River via Indian Creek. There are no proposed TMDL load allocations to the mines but their potential discharges may be addressed in the Klamath TMDL implementation plan.

Discharges of concern from the two mining areas related to the TMDL impairments are excess sediment and acid mine drainage, which commonly discharges metals and can lower the pH in nearby waters. Both mines were former superfund sites considered remediated by the USEPA; however sediment discharges were recently reported from

access roads to the mines. It was also recently reported that acid drainage may still be leaking from the Grey Eagle mine site but, thus far, has not been presented as a threat to water quality. Regional Water Board staff may periodically inspect mine sites to determine if acid mine drainage and sediment discharges are entering, and/or are threatening to enter nearby watercourses. If inspections determine that discharges are affecting the beneficial uses of water, Regional Water Board staff will make the appropriate recommendations at that time.

6.7 Alternative Approaches to Reducing Pollutant Loads

The Klamath TMDL includes nutrient and organic matter allocations to point and nonpoint sources in Oregon and California necessary to meet Oregon's water quality criteria and California water quality standards at Stateline. The allocations are assigned to the State of Oregon and are equal to the reductions required by Oregon's own TMDLs for Upper Klamath Lake, Lost River, and the Klamath River. The Klamath River TMDL determined that the largest portion of the pollutant loading to the Klamath River originates in Oregon and requires loading reductions up to 80% for nutrients and organic matter at the stateline. Nutrients from the upper basin were shown to contribute to the large diurnal swings in the dissolved oxygen downstream, as well as the development of nuisance blooms of toxic algae in the reservoirs.

The allocation at the stateline will require an unprecedented level of cooperation between California, Oregon, and the federal government to achieve the pollutant loading reductions necessary to meet water quality objectives and support beneficial uses in both states. To this end, Regional Water Board staff strongly encourage the implementation of centralized treatment options as part of the solution to reduce nutrient and organic matter loads to the Klamath River.

6.7.1 Options for Centralized Treatment

The Regional Board staff support implementation of centralized treatment due to the immediate need to improve critical water quality conditions in the Klamath Basin that are threatening beneficial uses. Further, reducing nutrient loadings in the near term is a critical component of whole-basin restoration that may include removal of the mainstem hydroelectric dams. Centralized treatment options that staff identify as potentially suited to this purpose include treatment wetlands, harvesting of algae to produce biofuels and fertilizer, and small scale conventional wastewater treatment systems. Certain treatment wetland systems have also demonstrated benefits by reducing water temperature.

Centralized treatment options would not absolve landowners of their responsibility to control the water quality impacts associated with their land use activities. The Regional Water Board and the Oregon implementation agencies would continue to employ the traditional non-point source control program. The support for centralized treatment is in recognition of the immediate need for nutrient and organic matter reductions relative to the typically long timeframes associated with implementing nonpoint source control programs.

6.7.2 Pollutant Trading to Reduce Nutrient Loading

The possibility of centralized treatment also presents the opportunity for pollutant trading in the Klamath Basin. This makes engineering and economic sense in that the high concentrations of nutrients and organic matter originating in the upper basin, mostly from Upper Klamath Lake and the Lost River Basin, are more effectively treated closer to their source. In other words, it makes more sense to employ an engineering solution upstream, where pollutants are relatively more concentrated, rather than downstream, where pollutants become diluted as flows increase. Investments in nutrient reduction strategies in the upper basin have a higher "value added" for beneficial use restoration than, for example, investing in systems to reduce nutrients within the Klamath Hydroelectric Project reservoirs and other point and nonpoint sources. So, for example, downstream responsible parties, including PacifiCorp among others, may be able to contribute to nutrient and organic matter reductions from the upper basin as opposed to providing reductions at their discharge location. Pollutant trading programs can be highly effective and have been utilized in other river basins in the country. In the North Coast Region, the City of Santa Rosa is developing a program to offset their nutrient loading to the Russian River by reducing nutrient loads from alternative nonpoint sources.

6.7.3 Proposed Workshop

To explore the possibility of centralized treatment and possible pollutant trading scenarios in the Klamath River Basin, Regional Board staff are proposing a public workshop to be hosted by a third party. The purpose of the workshop would be to bring together scientists and other experts to present information on centralized treatment and offset programs with the goal of identifying and developing preliminary design for centralized treatment options in the upper basin. Regional Board staff are still developing the workshop format and encourage the reader to submit suggestions regarding existing research and potential treatment options.

References

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